UNIT 1

MANAGEMENT OF SPORTING EVENTS

TOPICS & LEARNING OUTCOMES

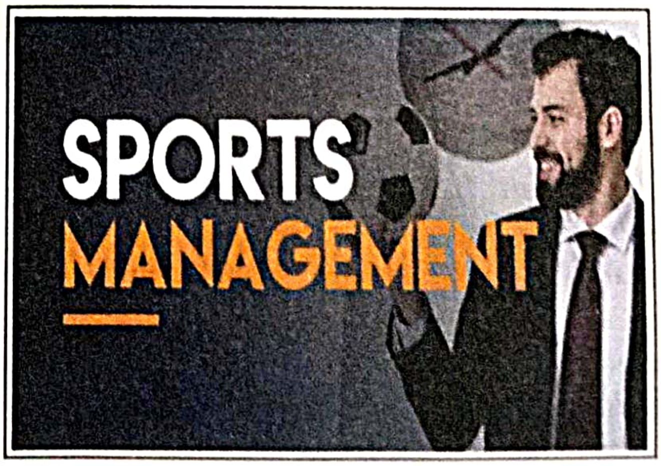
1. **Functions of Sports Events Management (Planning, Organising, Staffing, Directing & Controlling) : It gives understanding of Sports Management, its parts and its importance in conducting sports events.**
2. **Various Committees & their Responsibilities (pre;during & post) : It helps to understand various tournament committees and their role.**
3. **Fixtures and their Procedures – Knock-Out (Bye and Seeding) and League (Staircase and Cyclic, Tabular method) and Combination Tournaments : This topic helps to know various types of tournaments and how to make fixture of these.**
4. **Intramural & Extramural Tournaments – Meaning, Objectives and Its Significance : With this students can understand the meaning, significance and importance of Intramural and Extramural Tournaments.**
5. **Community Sports Program (Sports Day, Health Run, Run for Fun, Run for Specific Cause and Run for Unity : To teach them about the different types of community sports and their importance in our society.**

1. FUNCTIONS OF SPORTS EVENTS MANAGEMENT

CONCEPT OF SPORTS MANAGEMENT

The term " Management" is derived from the French word **Manager** which means **to use things carefully.** Management is a problem-solving process of effectively achieving organizational objectives through the efficient use of scarce resources in a changing environment. Management is an art of getting things done through and with the people in formally organized groups.

According to J Desensi "Management is the process of involving planning, organizing, evaluating and controlling human efforts to achieve stated objectives of an organization."



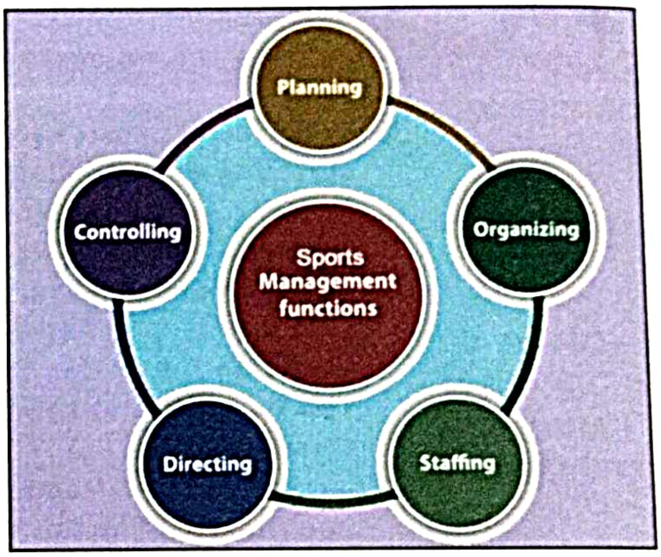
According to DeSensi, Kelley, Blanton and Beitel : "Sports management involves any combination of skills related to planning, organizing, directing, controlling, budgeting, leading, and evaluating within the context of an organization or department whose primary product or service is related to sport or physical activity."

Sports management is the field of business that focuses on the conduct and organization of sports event or tournament. It considers the planning,

organisation, staffing, directing, controlling processes for conducting it. In other words, it consists of administration, finance, law and ethics for conducting sports event. Sports Management is allied with physical education which deals organisations, conduct and management of games and sports activities for optimum level of competition along-with social and recreation values.

PARTS/ PHASES OF SPORTS MANAGEMENT

(A) PLANNING



PLANNING IS ONE OF THE MAIN PART OF THE MANAGEMENT. **Planning is a thoughtful, foresight and vision to the programme. It makes the programme goal oriented. Planning is the pre-work and it should be done before the programme. Planning comprises the process of setting goals, developing strategies and outlining tasks. In other words, it is a strategic and systematic arrangement for a programme.**

Planning is an intellectual process of thinking in advance about setting goals and developing strategies which are required to attain the goals efficiently. Planning in sports management is a process of thinking about and organizing the activities required to achieve a desired goal. It is a specific result that a person or system aims to achieve within a given time frame and available resources. In sports management, planning consists of considering the budget, approvals, type of tournament, requirements of tournaments, availability of resources and managing those resources etc.

(B) ORGANISING

Organising means arranging the required resource event for smooth conduct of sports under various heading or committees. In thus; the resources are arranged consisting of human as well as material and using them in best possible way. The organising of sports event; the available resources and other required things are noted or listed and then arranged as per the needs of tournament. The proper schedule is drafted considering the resources. The prime work or duties of various committes are assigned and concerned are informed. In other words, organizing in sports event is the process of identifying and grouping accordingly. Concerned in-charges are informed how to implement the plan while fulfilling the objectives of the tournament. It helps us to know about the available resources and using these resources efficiently, economically and effectively.

(C) STAFFING

Staffing means the working force which is responsible for attaining the objectives of the tournament. In sports event management, the staffing is grouping of the human resources and assigning them their duties. Staff is selected /chosen / taken as per their academic qualification, experience, capability and as per activity needs. It helps to divide the work under various heading and forming various committees accordingly. Staffing provides the right person for the right job. It also helps in assembling and connecting resources of man and material. The leadership ability of a person is considered in this process.

(D) DIRECTING

Directing is defining or explaining the duties and responsibilities of the concerned staff under various committees. In sports event management, the staff members are guided to use authority as per the guidelines/instructions and use the available resources efficiently and effectively. The staff is also guided to tackle all types of situations in best possible way. Proper direction helps to conduct sports event without hindrance while fulfilling the objectives of the tournament. Direction initiates the actions of the staff. It guides to use the human resources efficiently. It should be done by experienced or expert person.

(E) CONTROLLING

It is done during the progress of the tournament. It is done to increase the efficiency and effectiveness of the tournament. It helps to achieve the purpose of the tournament. It is gained by proper coordination between various committees. It can be done by increasing or decreasing the work as per requirement of the tournament. **Controlling, in sports event management, fulfills the immediate requirement or need during the progress of the tournament. Continuous evaluation and effectiveness of the tournament is done and corrected as per needs. The staff is guided or supervised accordingly.**

FUNCTIONS OF SPORTS EVENTS MANAGEMENT

(*i*) Helps to Achieve the Aim of Programme : Good management and good planning in sports help to achieve the aim and objectives of the programme along with time and finance available for the programme. Planning in sports event management gives direction to achieve the desired goal and targets.

(*ii*) Ensure Success : A well planning in sports event provides good management and ensures the success of the sports programme or events, thus failure can be prevented as planning reduces the chances of mistakes.

(*iii*) Establishing Coordination : It brings good coordination among various committees and helps to improve the programme efficiency.

(*iv*) Reduces Undue Pressure : Well management skills and good planning help to reduce the undue pressure of immediacy thus less stressful during the event or tournament.

(*v*) Good Control : Management skills improves the organization skills; it provides good control and directions to various committees to perform their work as a team in a systematic way.

(*vi*) Increases Efficiency : Good management and well planning improve the efficiency, thus maximum output can be gained; moreover, it reduces the stress.

(*vii*) Prevents Wastage : It prevents wastage of resources, moreover, wastage of time can be prevented.

(*viii*) Develops Creative Ideas : It helps to develops creative ideas, thus promotes innovation.

(*ix*) Proper Schedule : Good management skills helps to make good schedule of the tournament, thus good utilization of time with comfortable rest time for officials.

2. VARIOUS COMMITTEES AND THEIR RESPONSIBILITIES (PRE; DURING AND POST)

TOURNAMENT ORGANISING COMMITTEES

Today, sports event or tournaments are participated with great enthusiasm among large number of teams or people. A well-organised tournament is one of the best methods for evaluating the skills of a team. Good sports event or tournament has healthy competition and to organize it good planning is also required. To organize any sports event, various committees are formed for its systematic and smooth conduct.

Formation of committees should be based on three levels of management – top, middle and lower levels.

Hierarchy of Organising Committee	
For Intramural Event	**For Extramural Event**
Chairperson / Chief Patron/ Director (Principal of Institution)	**Chairperson / Chief Patron / Director (Director of Sports in State)**
Convener (Physical Education Teacher)	**Convener (District Education Officer or Deputy / Assistant Sports Director)**
Member (Teachers of School)	**Member (Physical Education Teachers of Different Schools)**
President (Head Boy / Girl) **Secretary (Sports Captain)**	**Organizing Secretary (Physical Education Teacher)**

For smooth conduct of sports tournament, it is necessary to form various committees which should perform their duties with full responsibility along with good coordination among them. The duties of these committees have to do a lot of work which is categorized as Pre-Tournament Work, During Tournament Work and Post-Tournament Work.

VARIOUS TOURNAMENT COMMITTEES AND THEIR RESPONSIBILITIES (WORKS)	
Organizing Committee	**Pre Work :** Does all the Planning for the success of the tournament; to get approvals from higher authority; to discuss Budget and getting approvals; to make arrangements of equipments (considering the available or to be purchased like Ground equipments, Official Table equipments, Ceremony equipments, certificates; medals etc); to make fixtures; to form various committees and its staffing; drafting the rules and regulations; eligibility Performa and consent letter to various institutions for participation. **During :** To coordinate with different committees for smooth conduct of the tournament; checking of Performa and players, authentic age; to handle immediate problems; to deal with protests / objections etc. **Post Work :** To give vote of thanks to the concerned, to make the final budget reports and expenses details to higher authorities, etc. **Headed by Chairperson and managed by Convener or Organizing Secretary.** **The prime work of Organizing committee is to do all the Planning work for the success of the tournament; to get approvals from higher authority; to discuss the Budget and getting approvals for the tournament etc.**
Technical Committee	**Pre Work :** To do all arrangements over the playfield as technical requirement like score-sheet, official table equipments of the game. **During :** To check and conduct tournament/ matches as per rules and schedule, to perform duty as Referee/Umpiring duty; during the game; to handle Table official duty; to manage the Timekeeper duty; to fill score-sheets, to check the scoreboard as per score-sheet, etc. to handle the technical disputes; to deal with protests/ objections etc;

	Post Work : To make the report of the tournament; to inform the success of the tournament to the concerned game Federation/ Association. **Headed by Chief Official and Officials like Referees, Umpires, Judges, Time-keepers etc.** **Works under Organizing Committee. Their prime works are to check the technical aspects like playfield and its marking; equipments procurement; helps in making fixture and conduct of matches.**
Finance Committee	**Pre Work :** To get details of approximate expenses under various headings and make Budget accordingly; to get approvals and sanctions from higher authorities; plans for raising funds by sponsorship etc. **During :** To provide funds for purchase of sports equipments, stationary, medals, certificates etc; to collect funds for meals from the teams, accounting and managing the expenses etc. **Post Work :** To maintain records / bills of purchase, payments etc; to prepare exact financial report of the tournament. **Works under Organizing Committee. Their prime works are to make Budget, its approval and its sanctions; managing purchase, payments to officials, accounting; raising funds by sponsorship for tournament.**
Registration Committee or Reception Committee	**Pre Work :** To arrange all required details of tournament ; to get the schedule fixture details; to be enquire and aware of boarding and lodging rules; to check team details well in advance; transport requirements etc. and inform it to the concerned. **During :** The first interaction of the teams is done by Reception Committee where reporting teams are informed about tournament schedule; their stay arrangements and other important information is provided.; hard copy of eligibility Performa of the teams are collected and checked; collects the payments of meals, security amount, etc. **Post Work :** To check and refund the security amount to the teams, to handover the certificates to the departing teams.
Accommodation Committee or Boarding and Lodging Committee	**Pre Work :** To get the details of the out-stationed teams and their boarding and lodging plans; to arrange the equipments like beddings, pillows, bed sheets etc.; plans for the good meals to the teams and official. **During :** This committee manages the comfortable stay of out-stationed teams; to provide good meal for the teams without disturbing their match schedule. **Post Work :** To collect and return the borrowed equipments.
Award Committee or Ceremonial Committee	**Pre Work :** This committee handles the opening and closing ceremony; arranges the required equipments; recreation program, decoration of pandal/ stage/ arena, etc. **During :** This committee manages the guests, officials during opening and closing ceremony; ceremonial welcome and speeches; prize distribution, etc. **Post Work :** To return the equipments.
Publicity Committee or Press and Media Committee	**Pre Work :** To inform media and press about the tournament; to inform press about dignified guests. **During :** To make daily report for press notes and coordinates with media persons, photography and video-graphy of the tournament. **Post Work :** To highlight the main features of the tournament in an impressive way.

Certificate Committee	**Pre Work :** To collect certificates from the Organizing Secretary; get instructions regarding filling of certificates. **During :** To write certificates beautifully and carefully; to give the participation certificates to non-positioned teams and merit certificates to winning teams; to maintain records of certificates. **Post Work :** To maintain details of issuing certificates, return the unused and damaged certificates to the Organizing Secretary.
Medical Committee or First Aid Committee	**Pre Work :** To arrange medical equipments, medicines and tools near the ground. **During :** To provide first aid and medical aid to injured or sick players, etc. **Post Work :** To return the borrowed equipments and make report of the medical aid given during tournament.
Transportation Committee	**Pre Work :** To plan for pick-up of arriving teams. **During :** To provide transportation for the out-stationed teams and departing teams. **Post Work :** To make the detailed reports of transportation during tournament and inform the concerned authority.
Announcement Committee	**Pre Work :** To arrange and check the public address system. **During :** To make important announcements and do commentary of the matches. **Post Work :** To make the summary of important announcement and return the records etc. to the concerned.
Recorders and Bulletin Board Committee	**Pre Work :** To arrange required equipments. **During :** To keep the record of all matches and display the results over bulletin board. **Post Work :** To manage the results and score-sheets of matches.
Refreshment Committee	**Pre Work :** To purchase and arrange refreshment for players and officials, guests etc. **During :** To distribute the refreshment to players and officials, guests etc. **Pre Work :** To make the summary of expenses on refreshment etc. and inform the authority.
Accreditation Committee or Discipline Committee	**Pre Work :** To check the crucial and dangerous points and make arrangements accordingly; to consider players and spectators safety. **During :** This committee manages the over-all discipline of the tournament, checks and controls violence, ensures that there is no hindrance during progress of match; monitors spectators etc. **Post Work :** To provide safe exit to players and spectators.

3. FIXTURES AND THEIR PROCEDURES

TOURNAMENT : Tournament is referred as healthy competition to decide the best team in a game or sport. In other words, it is a competition to decide the winner or top ranked team/teams. Thus, tournament is the series of games or matches played among various teams to determine the winner. It is the sports festival where teams play against each other in a congenial way. Tournaments are essential and the most important part of physical education curriculum. These are the best ways for satisfying the natural will of competition.

TOURNAMENT
Time!

Tournaments- Knockout, League & Combination

- **Four types of tournaments**
  1. **Knock-out Tournament**
  2. **League or Round Robin Tournament**
  3. **Combination Tournament**
  4. **Challenge Tournament**

Nowadays tournaments are organized in a civilized way with certain rules and regulations which every team has to follow. It provides opportunity to demonstrate skill, evaluate performance, motivate players to perform well, popularize sports, to develop healthy environment etc. A tournament provides good platform to display the talent and perfection of skills, techniques, tactics and strategies. Tournaments also provide evaluation and comparison of teams. Thus, they act as inspiration and encouragement for students.

The type of tournament depends upon various factors like funds available, time period or duration, level or standard of teams, infrastructure available, staff available, facilities available, etc. The success of tournament depends upon suitable fixture. Tournaments are played in various forms of fixture.

FIXTURE : Fixture is a process of arranging the teams in a systematic order or in various groups for competitive fights for physical activity. In other words, it is a set-up of various teams for competitive matches where they can play against each other in a systematic order as per the prescribed fixture schedule. In Sports, the term Fixture refers to the programme listing which team is to play with whom, where and when. In some sports activities, **Fixture is also termed as "Tie or Heat". "Tie" is commonly used in Racquet games like Badminton, Tennis, Table Tennis etc. "Heat" is commonly used in multi-players activity to show progressive matches like in Athletics, Swimming etc.**

3.(A) TYPES OF TOURNAMENTS

TYPES OF TOURNAMENTS			
Knock-out or Elimination Tournament	**League or Round Robin Tournament**	**Combination Type Tournament**	**Challenge Tournament**
It is a tournament in which a team continues to play further matches as per schedule till defeated, i.e., a team gets eliminated to play further if defeated or loses.	In this system of tournament, every team has to play with every other team irrespective of Win or Defeat or Draw. (It can be made by Stair method, Cyclic method or Tabular method)	In this type of tournament, a team has to clear two stages or phases; which are in combination of knock-out and league rounds i.e. clubbing. This type of tournament is beneficial when there is large number of or teams participants; from different region or areas.	This type of tournament is used to give ranking. If a team/ players are not satisfied by their ranking they have to challenge upper ranked team and has chance to replace. In this way they have to proceed step by step to improve their ranking.
Its types are : **Single Knock-out :** In this tournament, a team continues to play further matches schedule till defeated.	**Its types are :** **Single League :** In this player / team has to play once with all.	**Its types are :** **Knock-out cum League :** In this the first phase is of Knock-out round and top few teams of knock-out then play League round.	**Its types are :** **Ladder type Challenge method**

Seeding : Seeding means placing the good teams (previous position holder) at beneficiary places. **Consolation Type :** In this the defeated teams gets another opportunity to play further.	**Double League :** In this player/team has to play twice. **League cum League also named as Super League :** In this the top teams of each group has to play another league round.	**League cum Knock-out :** In this the first phase is of League round and top few teams of league then play Knock out round.	**Pyramid / Cobweb type Challenge method :** In this there are many players at same ranking. If they have to improve their ranking; They have to compete with all other players at same ranking.

3.(B) KNOCK-OUT OR ELIMINATION TOURNAMENT AND ITS PROCEDURE (BYE AND SEEDING)

Knock-out is a type of tournament in which a team continues to play further matches as per schedule till defeated, i.e., a team gets eliminated to play further if defeated or loses. In this tournament, only the victorious team is allowed to play further matches until one team emerges as winner.

In Knock-out tournament, the number of matches will be equal to number of teams for deciding the best three teams. Knock-out tournament has less number of matches as compared to other types of tournaments, thus easy to conduct. Knock-out tournament is economically beneficial; less time consuming and less stress over organizers. This tournament has one big demerit that sometimes good team may gets eliminated and weak team may comes ahead. Thus, skilled selection cannot be done.

The number of matches in Knock-out tournament is one less than the number of teams i.e., N-1(where N is number of teams). Knock-out tournament is played in various forms like

(a) **Single Knock-out tournament :** In this a team continues to play further matches till defeated.

(b) **Seeding type tournament :** Seeding means placing the good teams (previous position holder) at beneficiary places.

(c) **Consolation type tournament :** In this the defeated teams get another opportunity to play further.

MERITS OF KNOCK-OUT

(i) Economical Tournament : In Knock-out tournament, there are less number of matches as compared to others. Thus, this type of tournament is more economical for organizers as well as for teams.

(ii) Less Time : In Knock-out tournament, less time is consumed to finish the tournament, thus easy to conduct.

(iii) Good Team Emerges Winner : This tournament brings up good team whereas weak team gets eliminated.

(iv) Less Tiredness to Players : As there are less number of matches, thus less stress or tiredness over the players and organisers.

(v) Spectators' Interest : In this tournament, spectators' interest is high.

DEMERITS OF KNOCK-OUT

(i) Good Team may gets Eliminated : In Knock-out tournament, sometimes good team may gets eliminated and weak team may comes ahead.

(ii) Skilled Selection not Possible : In Knock-out tournament, good selection of players is not possible as good players may lose their match in initial matches.

(iii) High Stress on Players : In this tournament, every match is in Do-or-Die condition, thus, every player is under stress.

BYE PROCEDURE

In Knock-out tournament, number of the matches is one less than the number of teams (N – 1)

whereas for deciding the best three positions there are equal number of teams. In Knock-out tournament, sometimes 'Byes' are given to adjust the fixture as well as to give privilege to teams to play in next round of matches. In Knock-out fixture, care should be taken while giving Byes and Seeding.

BYE : **Bye is a sort of privilege to a team to play directly in second round. Bye means a team is not required to participate in the primary round due to allotment of draw. A team that is given Bye does not play in the First Round.** Bye is an opportunity to play the match in higher round without playing in the lower round. These are given to adjust the fixture as well as to give privilege to teams to play in next round. It is only given in Knock-out tournament. Bye is also a necessity to complete the draw.

STEPS OF KNOCK-OUT FIXTURE AND GIVING BYE

Step 1. To determine the number of Matches : In Knock-out tournament, **number of the matches is one less than the number of teams i.e. (N – 1) to get top two teams; (whereas for deciding the best three positions, the number of matches is equal to number of teams.)**

Step 2. To determine the number of Rounds : It is done by considering the equal or upper limit in the power of two's i.e. number of teams between (upper 2, 4, 8, 16, 32, 64, 128, ... etc. which is $2^1, 2^2, 2^3, 2^4, 2^5, 2^6, 2^7, 2^8$......... etc. where power of two's is considered as number of Rounds; like

For 4 teams : The nearest number in power of two's, i.e. $2^2 = 2 \times 2 = 4$ thus, two Rounds in fixture

For 13 teams : The nearest power of two's is four, i.e. $2^4 = 2 \times 2 \times 2 \times 2 = 16$ (Four Rounds).

For 23 teams : The nearest power of two's is five, i.e. $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$ (Five Rounds)

For 51 teams : The nearest power of two's is six, i.e. $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$ (Six Rounds).

Step 3. To determine the number of team in Upper and Lower Half : In Knock-out tournament, total teams (even number of teams) are divided into two equal halves. **In case of odd number of teams, the Upper half will be having one team more than Lower half.**

$$\text{Teams in Upper Half} = \frac{\text{Number of teams} + 1}{2}$$

$$\text{Teams in Lower Half} = \frac{\text{Number of teams} - 1}{2}$$

Step 4. To determine the number of Byes : If the number of teams is : 2, 4, 8, 16, 32, 64, 128, ... (Number being a multiple of two) then there is no need of Bye. But if the number of teams is other than this then **Byes in a fixture are decided by subtracting the number of teams from the nearest "power of two's " like 2, 4, 8, 16, 32, 64, 128,.... etc.** Bye is also a necessity to complete the draw; like

For 11 teams : Considering the nearest power of two's is four (four Rounds) is 16. Subtracting 11 from 16; i.e. (16-11) = 5, thus 5 Byes. (2 Byes in upper half and 3 Byes in lower half)

For 19 teams : Considering the nearest power of two's is five (five Rounds) is 32. Subtracting 19 from 32; i.e. (32-19) = 13, thus 13 Byes. (6 Byes in upper half and 7 Byes in lower half)

For 45 teams : Considering the nearest power of two's is six (six Rounds) is 64. Subtracting 45 from 64; i.e. (64- 45) = 19, thus 19 Byes. (9 Byes in upper half and 10 Byes in lower half)

Step 5. Bye distribution in Upper and Lower half : Teams having byes will not play their first-round matches. When there is even number of Byes, they are equally divided in upper and lower half in symmetry.

But in case of odd number of Byes the upper half will have one less Bye whereas lower half will have one more Bye than upper half.

Step 6. Allotting or arranging or distribution of Byes : **The first Bye is given to the last team of lower half. The second Bye is given to the first team of upper half. The third Bye is given to the first team of lower half. The fourth Bye is given to the last team of upper half. The next Bye or Byes will be given in the same pattern or order.**

Step 7. Drawing Illustrating the Fixture : Next step is to draw the fixture; showing or mentioning the details like Date, Time, Ground No. and Venue of the match.

S.No.	Round No.	Match No.	.... V/s	Date	Time	Venue / Ground No.	Result
1.	1 Q.F.	1	1 V/s 2	5th Oct.	9.00 A.M.	DC Ground No. 1	Q. Final
2.	1 Q.F.	2	3 V/s 4	5th Oct.	10.00 A.M.	DC Ground No. 1	Q. Final
3.	1 Q.F.	3	5 V/s 6	5th Oct.	11.00 A.M.	DC Ground No. 1	Q. Final
4.	1 Q.F.	4	7 V/s 8	5th Oct.	12.00 A.M.	DC Ground No. 1	Q. Final
5.	2 S.F.	5	Winner of Match 1 V/s Winner of Match 2	6th Oct.	9.00 A.M.	DC Ground No. 1	S. Final
6.	2 S.F.	6	Winner of Match 3 V/s Winner of 4	6th Oct.	10.00 A.M.	DC Ground No. 1	S. Final
7.	Final	7	Winner of Match 5	7th Oct.	10.00 A.M.	DC Ground No. 1	Final

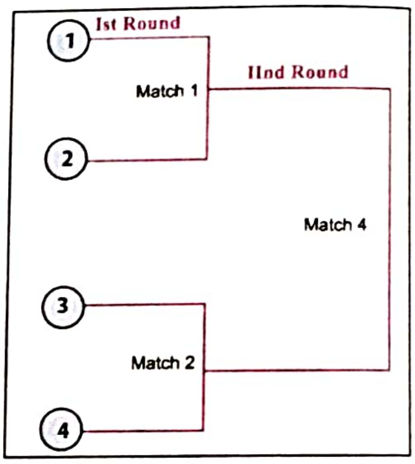
Example 1. Knock Out Fixture for 4 teams :

No. of Matches is N – 1 = (4 – 1) = 3

No. of Rounds is $2^2 = 2 \times 2$ Power of two is 2 thus two Rounds in fixture

No. of Bye is Nil as there are 4 teams (2 Rounds are complete).

No. of teams in upper half = 2; No. of teams in lower half = 2

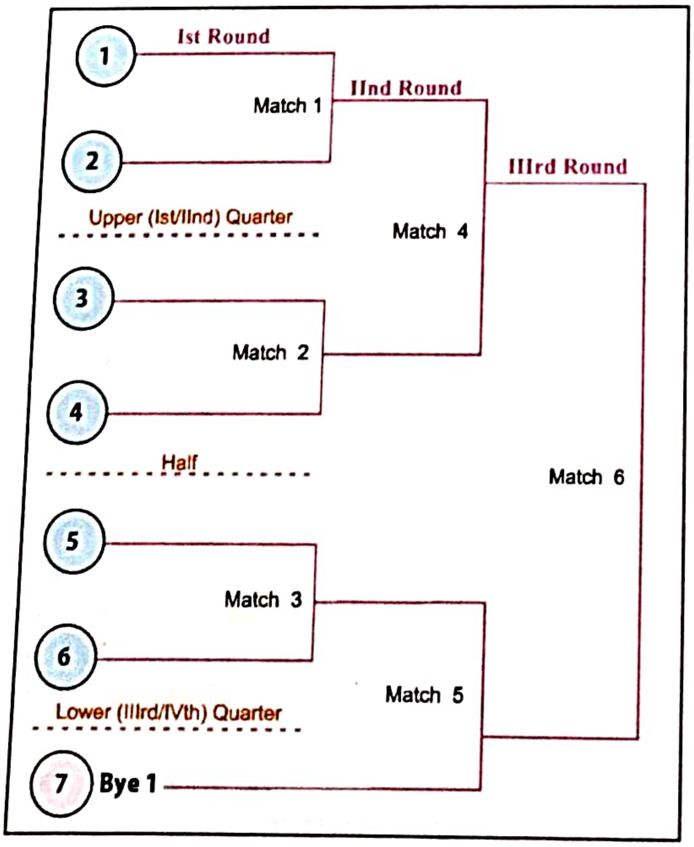

1
Ist Round
IInd Round
Match 1
2
Match 4
3
Match 2
4

Example 2. Knock Out Fixture for 7 teams :

No. of matches is N – 1 = (7 – 1) = 6 (7 in case; to get top three teams) with three Rounds

No. of teams in upper half = 4 and No. of teams in lower half = 3

No. of Byes = 8 – 7 = 1 bye; in lower half


1
Ist Round
Match 1
IInd Round
2
IIIrd Round
Upper (Ist/IInd) Quarter
Match 4
3
Match 2
4
Half
Match 6
5
Match 3
6
Match 5
Lower (IIIrd/IVth) Quarter
7
Bye 1

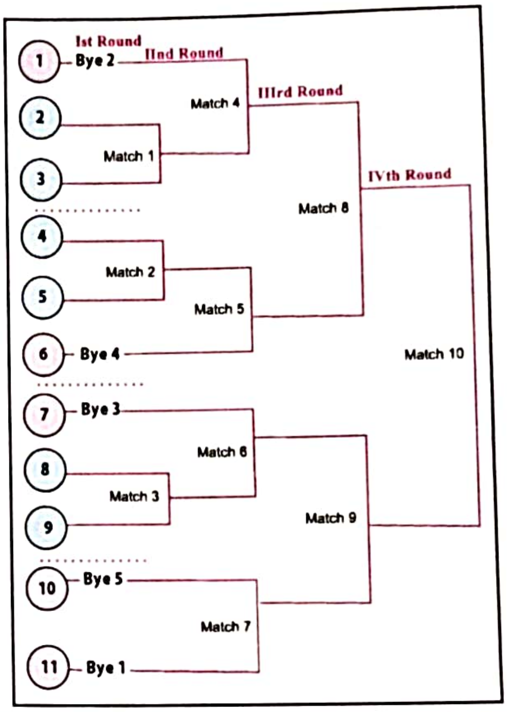
Example 3. Fixture for 11 teams :

No. of matches is N – 1 = (11 – 1) = 10 with four Rounds

No. of teams in upper half = $\frac{N+1}{2} = \frac{11+1}{2} = 6$

No. of teams in lower half = $\frac{N-1}{2} = \frac{11-1}{2} = 5$

No. of Byes = 16 – 11 = 5 bye; (Two Byes will be given in upper half and three Byes will be given in lower half i.e. I, II, III, quarter will have one Byes whereas IV quarter will have two Byes)


Ist Round
IInd Round
IIIrd Round
IVth Round
1
Bye 2
2
3
4
5
6
Bye 4
7
Bye 3
8
9
10
Bye 5
11
Bye 1
Match 1
Match 2
Match 3
Match 4
Match 5
Match 6
Match 7
Match 8
Match 9
Match 10

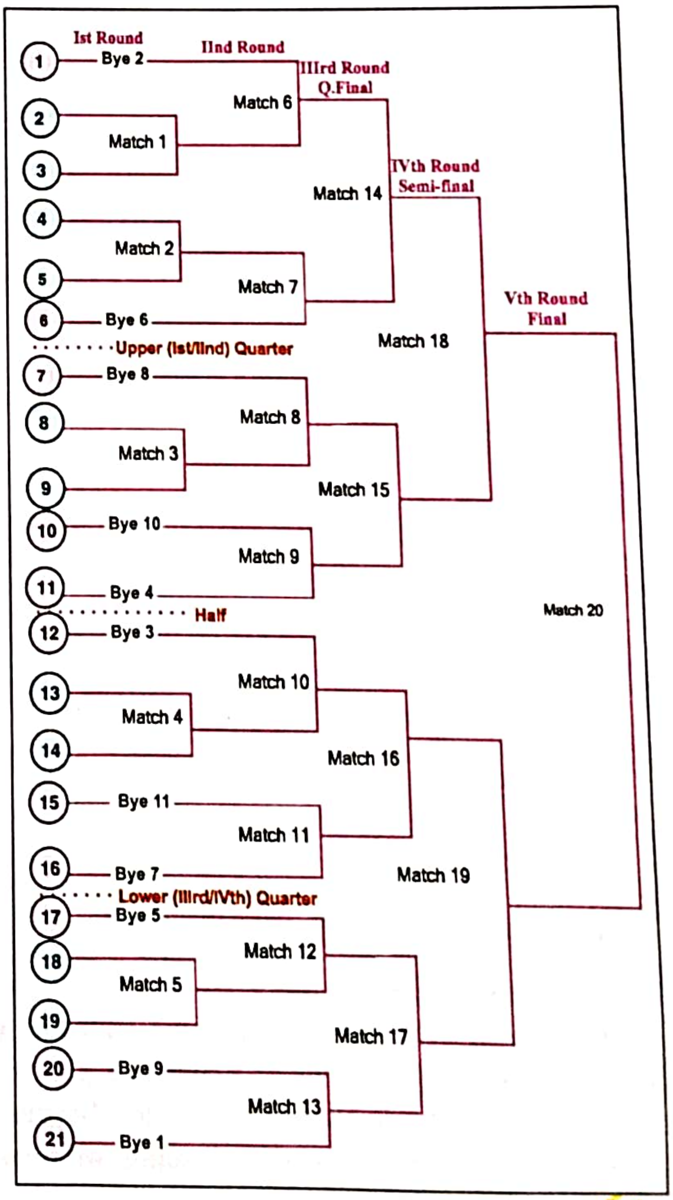
Example 4. Knock-out Fixture for 21 teams :

No. of matches is N – 1 = (21 – 1) = 20 (21 in case; to get top three teams) with five Rounds

No. of teams in upper half = $\frac{N+1}{2} = \frac{21+1}{2} = 11$

and No. of teams in lower half = $\frac{21-1}{2} = 10$

No. of Byes = 32 – 21 = 11 bye; (Five Byes will be given in upper half and five Byes will be given in lower half i.e. Two byes in I quarter; Three byes in II, III and IV quarters)

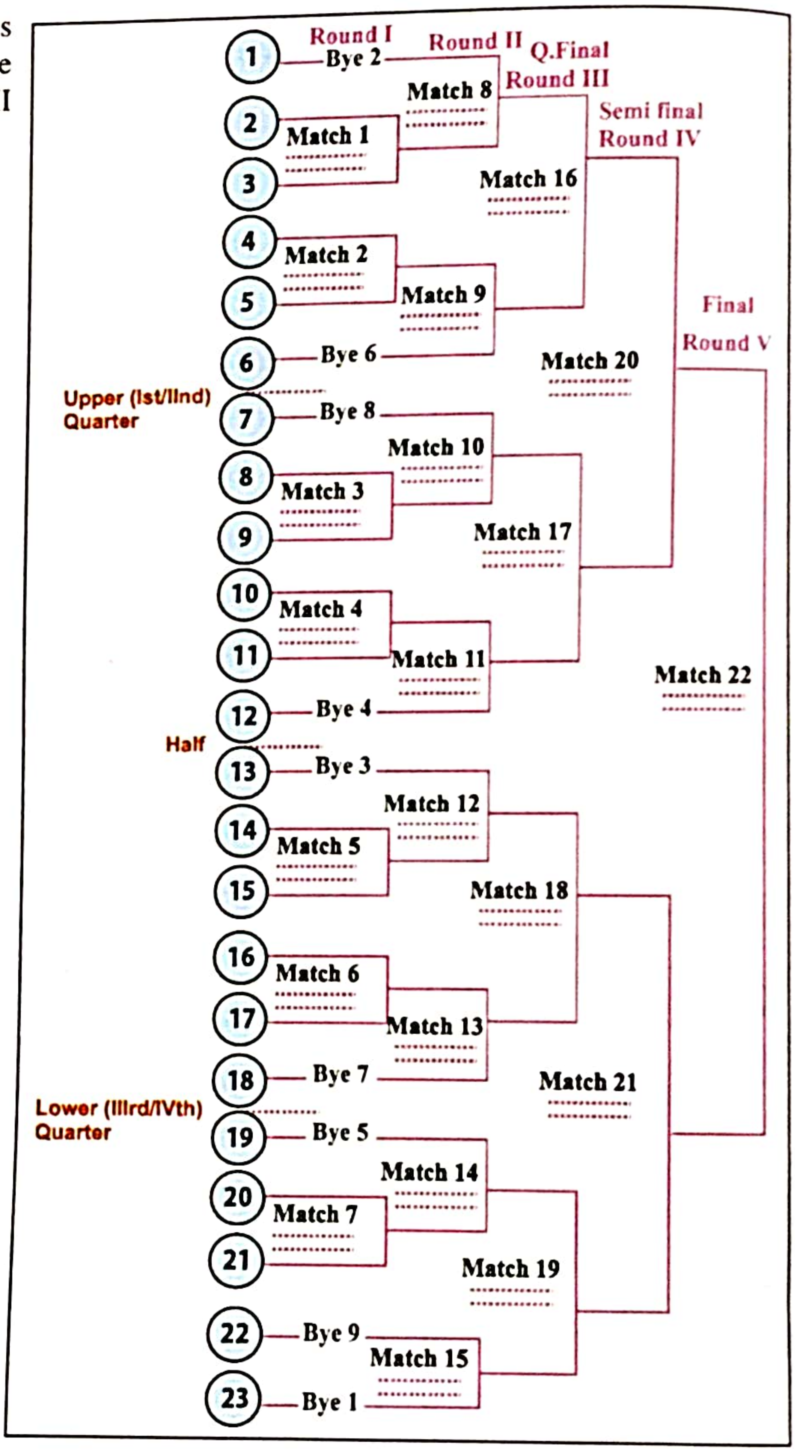

Ist Round
IInd Round
IIIrd Round
Q.Final
IVth Round
Semi-final
Vth Round
Final
1
Bye 2
2
3
4
5
6
Bye 6
Upper (Ist/IInd) Quarter
7
Bye 8
8
9
10
Bye 10
11
Bye 4
Half
12
Bye 3
13
14
15
Bye 11
16
Bye 7
Lower (IIIrd/IVth) Quarter
17
Bye 5
18
19
20
Bye 9
21
Bye 1
Match 1
Match 2
Match 3
Match 4
Match 5
Match 6
Match 7
Match 8
Match 9
Match 10
Match 11
Match 12
Match 13
Match 14
Match 15
Match 16
Match 17
Match 18
Match 19
Match 20

Example 5. Knock-out Fixture for 23 teams :

No. of matches is N – 1 = (23 – 1) = 22 (23 in case; to get top three teams) with five Rounds

No. of teams in upper half = $\frac{N+1}{2} = \frac{23+1}{2}$ = 12 and No. of teams in lower half = $\frac{N-1}{2} = \frac{23-1}{2}$ = 11

No. of Byes = 32 – 23 = 9 bye; (Four byes will be given in upper half and five byes will be given in lower half i.e. Two byes in I, II and III quarter; Three byes in IV quarters)


Round I
Round II
Q.Final
Round III
Semi final
Round IV
Final
Round V
1
Bye 2
Match 8
2
Match 1
3
Match 16
4
Match 2
5
Match 9
6
Bye 6
Match 20
Upper (Ist/IInd) Quarter
7
Bye 8
Match 10
8
Match 3
9
Match 17
10
Match 4
11
Match 11
Match 22
12
Bye 4
Half
13
Bye 3
Match 12
14
Match 5
15
Match 18
16
Match 6
17
Match 13
18
Bye 7
Match 21
Lower (IIIrd/IVth) Quarter
19
Bye 5
Match 14
20
Match 7
21
Match 19
22
Bye 9
Match 15
23
Bye 1

SEEDING FIXTURE PROCEDURE

Seeding is placing the good teams (previous position holder) at beneficiary places. Seeding is to arrange or schedule so that most teams or players are matched in later rounds of play. Seeding is placing the good teams at privileged places in fixture so that they should not compete at initial Rounds according to tournament rules. Seeding improves the Knock-out fixture as it prevents good teams from clashing at earlier Rounds whereas weak teams get eliminated.

Seeding is the process of playing in which some teams of the last year's performance are given seeding like first four teams of previous year are met before semifinal or up to quarter final (depending upon organizers). But in few tournaments these seeding teams can play directly in quarter final. It is given in the Knock-out fixture. Procedure of allotting seeding is the same as given for byes.

Example 6. Seeding Fixture of 13 teams (with four seeded teams).

No. of Matches = 13 – 1 = 12 (To get top two teams)

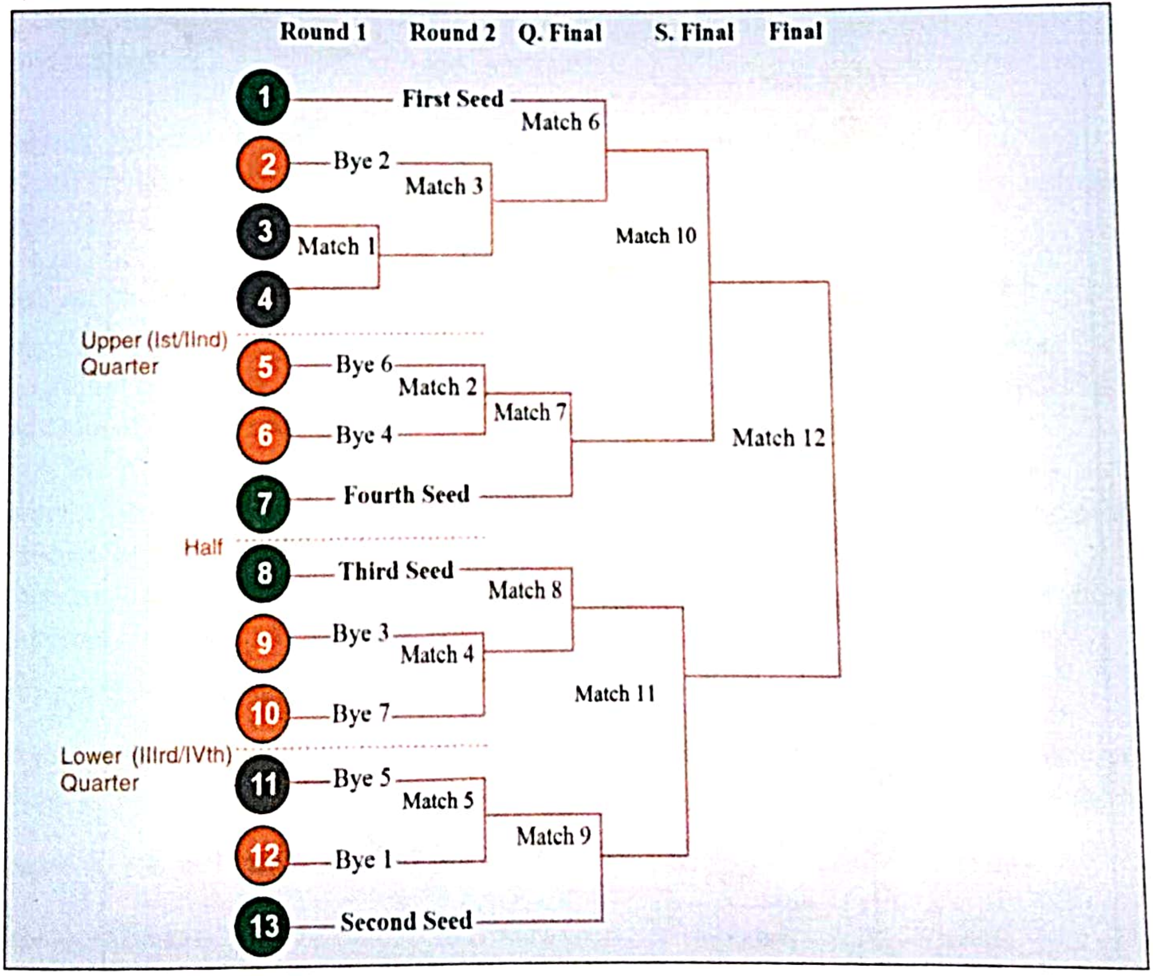
No. of Rounds = 4 (Round of 16 teams)

No. of teams in upper half = $\frac{N+1}{2} = \frac{13+1}{2}$ = 7 (Two seeded teams in upper half. In Ist quarter, first seed team is placed at the top, three non-seeded teams and one bye. In IInd quarter, fourth seed team is placed at the bottom, two non-seeded teams and two byes are adjusted.)

No. of teams in lower half = $\frac{N-1}{2} = \frac{13-1}{2}$ = 6 (Two seeded teams in lower half. In III quarter, third seed team is placed at top, two non-seeded teams and two byes are adjusted. In IV quarter, second seed team is placed at bottom, two non- seeded teams and two byes are adjusted.)

No. of Seeded teams = 4. Therefore, No. of non-seeded teams = 13 – 4 = 9

No. of Byes = 16 – 9 (From non-seeded teams) = 7 (I quarter one bye, and in II, III & IV quarter two byes each)


Round 1
Round 2
Q. Final
S. Final
Final
1
First Seed
Match 6
2
Bye 2
Match 3
3
Match 1
Match 10
4
Upper (Ist/IInd) Quarter
5
Bye 6
Match 2
Match 7
6
Bye 4
Match 12
7
Fourth Seed
Half
8
Third Seed
Match 8
9
Bye 3
Match 4
Match 11
10
Bye 7
Lower (IIIrd/IVth) Quarter
11
Bye 5
Match 5
Match 9
12
Bye 1
13
Second Seed

Example 7. Seeding Fixture of 25 teams :

No. of Matches = 25 – 1 = 24 (To get top two teams)

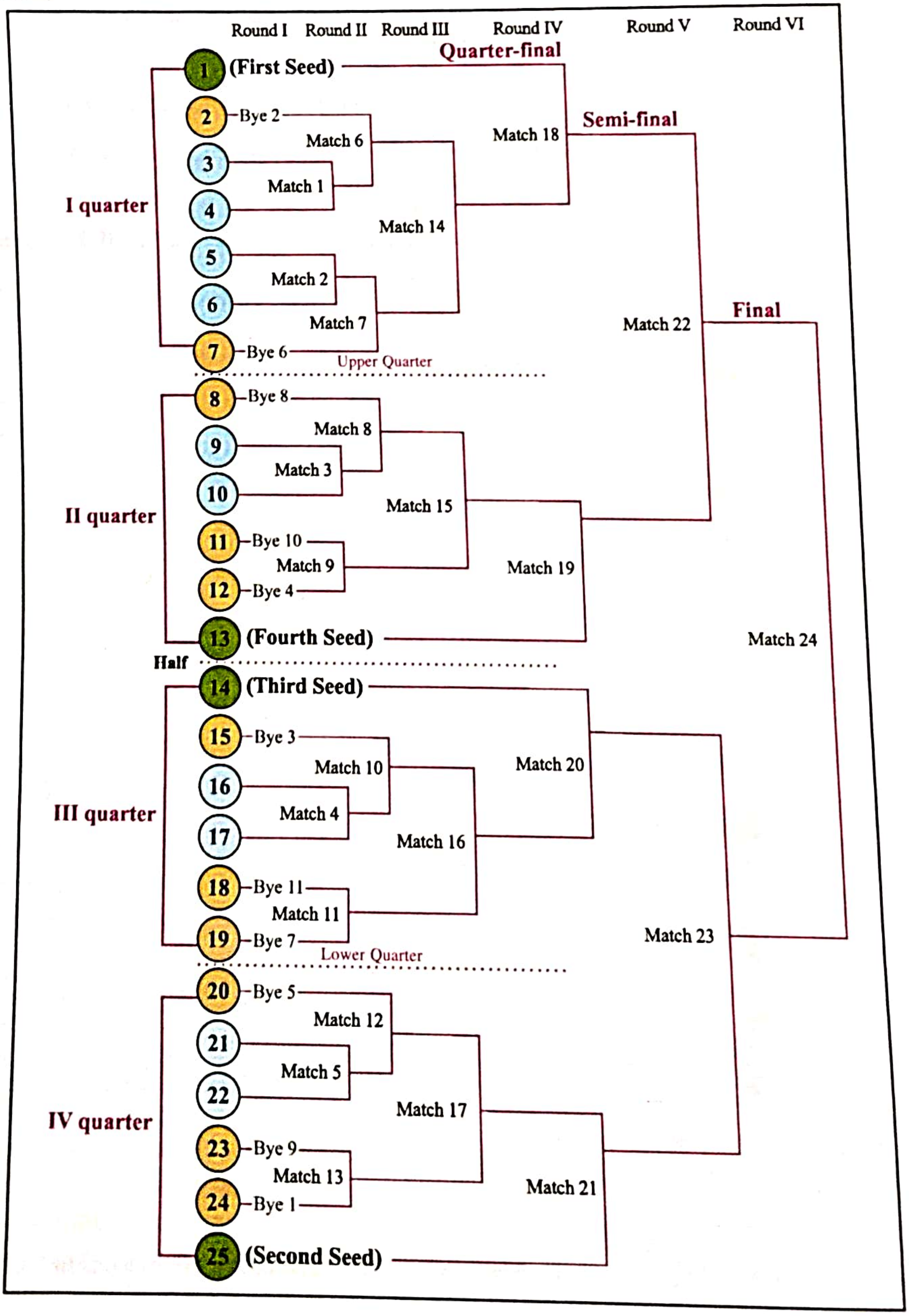
No. of Rounds = 5 (Round of 32 teams)

No. of teams in upper half = $\frac{25+1}{2}$ = 13 (In upper half, two seeded teams are placed. In I quarter, fi seed team at top, six non-seeded teams with two byes are placed. In II quarter, fourth seed team at bottom with five non-seeded teams and three byes are placed)

No. of teams in lower half $= \frac{25-1}{2} = 12$ (In lower half, two seeded teams are placed. In III quarter, third seed team is placed at the top with five, non-seeded teams and three byes are placed. In IV quarter, second seed team is placed at the bottom with five non-seeded teams and three byes are placed.)

No. of Seeded teams = 4. Therefore, No. of non-seeded teams = 25 – 4 = 21

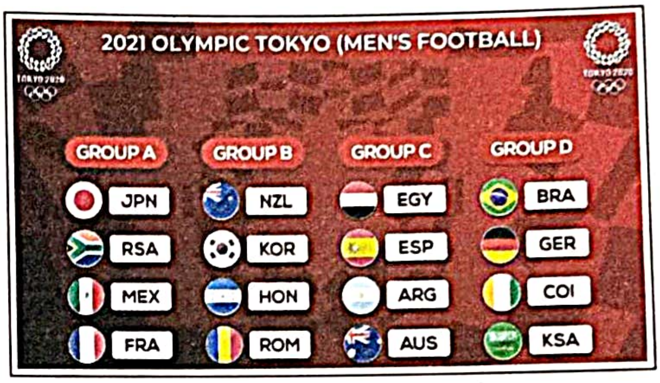
No. of Byes = 32 – 21 (From non-seeded teams) = 11 (I quarter two byes and in II, III & IV quarter three byes each)


Round I
Round II
Round III
Round IV
Round V
Round VI
Quarter-final
Semi-final
Final
1 (First Seed)
2 Bye 2
3
4
5
6
7 Bye 6
Match 1
Match 2
Match 6
Match 7
Match 14
Match 18
Match 22
I quarter
Upper Quarter
8 Bye 8
9
10
11 Bye 10
12 Bye 4
13 (Fourth Seed)
Match 3
Match 8
Match 9
Match 15
Match 19
II quarter
Half
Match 24
14 (Third Seed)
15 Bye 3
16
17
18 Bye 11
19 Bye 7
Match 4
Match 10
Match 11
Match 16
Match 20
III quarter
Lower Quarter
Match 23
20 Bye 5
21
22
23 Bye 9
24 Bye 1
25 (Second Seed)
Match 5
Match 12
Match 13
Match 17
Match 21
IV quarter

3.(C) LEAGUE OR ROUND ROBIN TOURNAMENT AND ITS PROCEDURE (STAIRCASE, CYCLIC, TABULAR)

In League tournament, a team has to play with every other team irrespective of Win or Defeat or Draw. League tournament is the best type of tournament as it provides the maximum number of opportunities to show the best performance, thus real winner can be picked up easily at the end.

MERITS OF LEAGUE TOURNAMENT



2021 OLYMPIC TOKYO (MEN'S FOOTBALL)

GROUP A	GROUP B	GROUP C	GROUP D
JPN	NZL	EGY	BRA
RSA	KOR	ESP	GER
MEX	HON	ARG	COI
FRA	ROM	AUS	KSA

***(i)* Ample Opportunities :** In league tournament, every team has to play with every other team, thus it provides ample or maximum opportunities to show their talent.

***(ii)* True Winner :** League tournament helps in getting the true or real winner at the end, thus deserving teams come up strongly.

***(iii)* Improves the Performance :** It provides good experience to teams to overcome their lacking, thus helps to improve performance.

***(iv)* Skilled Selection :** League tournament helps in selecting the good players or teams.

***(v)* Provide Ranking :** At the end of league tournament, every team gets the ranking, thus can evaluate themselves.

***(vi)* Players' Interest :** Good players develop interest and show high performance.

***(vii)* Good Challenge :** In this the team has sufficient matches to prove their ability and thus team overcome with challenge.

DEMERITS OF LEAGUE TOURNAMENT

***(i)* Time Consuming :** As the number of matches are more, thus it is more time consuming.

***(ii)* Large Arrangements :** League tournament requires large amount of arrangements like more playgrounds, more officials, more finance, etc.

***(iii)* Less Interest of Spectators :** In league tournament, spectators also show less interest.

***(iv)* Demoralizes Weak Team :** In this tournament, weak teams often lose interest due to repeated loss of matches and get psychologically demoralized.

***(v)* More Expensive :** League tournament is more expensive as there are large number of matches, large requirements of officials, arrangements etc.

LEAGUE FIXTURE TYPES

***(a)* Single League Tournament :** In Single League tournament, a team has to play with every other team only once. In such tournament, large number of matches are played which are calculated by the formula:

No. of matches in Single League :– $\frac{N \times (N-1)}{2}$ **where 'N' stands for number of teams.**

For instance, 12 teams, then the number of matches are : $\frac{12 \times 11}{2} = \frac{132}{2}$ = 66 matches

***(b)* Double League Tournament :** In this type of League tournament, a team has to play with other teams twice. Afterwards the total points are considered to decide the best team. The formula is

Number of matches in Double League : N × (N–1).

(c) Super League Tournament : In Super League tournament, large number of teams are grouped into small groups. The top few teams of each group play another league round. This tournament is very helpful when there is large number of teams from different regions or zones; as it reduces the number of matches (as compared with Single League tournament).

For instance, 30 teams are grouped into four groups (Group I with 8 teams, Group II with 8 teams, Group III with 7 teams and Group IV with 7 teams).

I. Group matches (with 8 teams) : $= \frac{8 \times 7}{2} = \frac{56}{2} = 28$ matches

II. Group matches (with 8 teams) : $= \frac{8 \times 7}{2} = \frac{56}{2} = 28$ matches

III. Group matches (with 7 teams) : $= \frac{7 \times 6}{2} = \frac{42}{2} = 21$ matches

IV. Group matches (with 7 teams) : $= \frac{7 \times 6}{2} = \frac{42}{2} = 21$ matches

The Top team or teams (organizer may consider one/ two / three / four etc.) to play again in Super League Round.

The matches in Super League tournament (considering top two teams four Groups) $= \frac{8 \times 7}{2} = \frac{56}{2} = 28$ matches.

Total number of matches (considering top two teams four Groups) = 28 + 28 + 21 + 21 + 28 = 106 matches

LEAGUE FIXTURE PROCEDURE (STAIRCASE, CYCLIC, TABULAR)

There are three types of making or drawing League or Round Robin Fixture.

Example Fixture of 7 teams in Single League Tournament :

No. of Matches in League Tournament of 7 teams $= \frac{N \times (N-1)}{2} = \frac{7 \times 6}{2} = \frac{42}{2} = 21$

(A) STAIRCASE LEAGUE FIXTURE METHOD

In Staircase method, one team will be fixed on the highest step, and that team will play with all the teams of the tournament and in next step down, the next team will be fixed to play with other remaining teams and so on. Here proper sequence of matches schedule is difficult to arrange.

1st Round	2nd Round	3rd Round	4th Round	5th Round	6th Round
1 – 2					
1 – 3	2 – 3				
1 – 4	2 – 4	3 – 4			
1 – 5	2 – 5	3 – 5	4 – 5		
1 – 6	2 – 6	3 – 6	4 – 6	5 – 6	
1 – 7	2 – 7	3 – 7	4 – 7	5 – 7	6 – 7

(B) CYCLIC LEAGUE FIXTURE METHOD

In Cyclic Method, one team will be fixed in position and the other will be placed in rotation to complete the cycle. The rotation is generally done in clockwise rotation. In even number of Rounds is one less than number of teams. Whereas in odd number of teams, one bye will be given to one team in one round and in next round another team will get a bye.

1st Round	2nd Round	3rd Round	4th Round	5th Round	6th Round	7th Round
Bye – 7 1 – 6 2 – 5 3 – 4	Bye – 1 2 – 7 3 – 6 4 – 5	Bye – 2 3 – 1 4 – 7 5 – 6	Bye – 3 4 – 2 5 – 1 6 – 7	Bye – 4 5 – 3 6 – 2 7 – 1	Bye – 5 6 – 4 7 – 3 1 – 2	Bye – 6 7 – 5 1 – 4 2 – 3

(C) TABULAR LEAGUE FIXTURE METHOD

	1	2	3	4	5	6	7	Bye
1		i 1-2	ii 1-3	iii 1-4	iv 1-5	v 1-6	vi 1-7	vii
2			iii 2-3	iv 2-4	v 2-5	vi 2-6	vii 2-7	i
3				v 3-4	vi 3-5	vii 3-6	i 3-7	iv
4					vii 4-5	i 4-6	ii 4-7	vi
5						ii 5-6	iii 5-7	i
6							iv 6-7	iii
7								v
Bye								

1st Round matches
1 – 2, 3–7, 4–6
2nd Round matches
1–3, 4–7, 5–6
3rd Round matches
1–4, 2–3, 5–7
4th Round matches
1–5, 2–4, 6–7
5th Round matches
1–6, 2–5, 3–4
6th Round matches
1–7, 2–6, 3–5
7th Round matches
2–7, 3–6, 4–5

DECIDING WINNER IN LEAGUE TOURNAMENT

(a) Basic Point System : In League matches, the scoring is complicated where data of each team is maintained like number of matches won/lost/draw. The winner/merit will be decided on the basis of points awarded to the teams. Example; Winner = 5, Draw = 3, Loser = 0. Points tally may be as follows : (in some cases the winner of match is awarded 2 points, for loss no point, for draw 1 point is awarded). Afterwards, final score is compared to decide winner.

Example :

Team Name	Matches Played	Matches Won (each of 5 points)	Matches Lost (each of 0 points)	Matches Draw (each of 3 points)	Total Points	Ranking
A/1	7	5	1	1	28	First
B/2	7	4	1	2	26	Second
C/3	7	5	2	0	25	Third
D/4	7	4	2	1	23	Fourth
E/5	7	3	3	1	18	Fifth
F/6	7	1	4	2	11	Sixth
G/7	7	1	5	10	8	Seventh
H/8	7	0	5	2	6	Eighth

In some types of league tournaments, the winner is decided by considering like this.

(b) British League Method : In this the winner is decided by dividing percent of points obtained from total points obtained.

Percentage of Points : $\frac{\text{Total Points Obtained}}{\text{Total Possible Points}} \times 100$

(c) American League Method : In this the winner is decided by dividing percent of matches won from matches played.

Percentage of Points : $\frac{\text{Matches Won} \times 100}{\text{Matches Played}}$

Example 8. Fixture of 19 teams in Super League Tournament :

The 19 teams are divided into four groups (Group A (five teams; 1 to 5), Group B (five teams; 6 to 10), Group C (five teams; 11 to15), Group D (four teams; 16 to 19))

No. of matches in Group A, B, & C of 5 teams in each group. $= \frac{N \times (N-1)}{2} = \frac{5 \times 4}{2} = \frac{20}{2}$

= 10 matches each, therefore, 10 +10 + 10 =30 matches

No. of matches in Group D of league round of first phase = $\frac{4 \times 3}{2} = \frac{12}{2}$ = 6 matches

No. of matches in Super League = $\frac{4 \times 3}{2} = \frac{12}{2}$ = 6 matches in Super League

Total No. of matches in Super League is 36 (30 + 6 first league round) + 6 (super league round) = 42 matches.

	Round I	Round II	Round III	Round IV	Round V
In Group A = 5 teams (1 to 5) No. of matches = $\frac{5 \times 4}{2}$ = 10 matches The top team of Group A in First League is 4	Bye–5 1 – 4 2 – 3	Bye–1 2 – 5 3 – 4	Bye–2 3 – 1 4 – 5	Bye–3 4 – 2 5 – 1	Bye–4 5 – 3 1 – 2
In Group B = 5 teams (6 to 10) No. of matches = $\frac{5 \times 4}{2}$ = 10 matches The top team of Group B in First League is 8	Bye–10 6 – 9 7 – 8	Bye–6 7 – 10 8 – 9	Bye–7 8 – 6 9 – 10	Bye–8 9 – 7 10 – 6	Bye–9 10 – 8 6 – 7
In Group C = 5 teams (11 to 15) No. of matches = $\frac{5 \times 4}{2}$ = 10 matches The top team of Group C in First League is 12	Bye–15 11 – 14 12 – 13	Bye–11 12 – 15 13 – 14	Bye–12 13 – 11 14 – 15	Bye–13 14 – 12 15 – 11	Bye–14 15 – 13 11 – 12
In Group D = 4 teams (16 to 19) No. of matches = $\frac{4 \times 3}{2}$ = 6 matches The top team of Group D in First League is 16	16 – 19 17 – 18	16 – 17 18 – 19	16 – 18 19 – 17		
In Super League the top teams of each group will play (4, 8, 12, 16) No. of matches = $\frac{4 \times 3}{2}$ = 6 matches	4 – 16 8 – 12	4 – 8 12 – 16	4 – 12 16 – 8		

3.(D) COMBINATION TYPE TOURNAMENTS PROCEDURE

In this tournament a team or player has to clear two stages or phases which are in combination of Knock-out and League fixture rounds, i.e. clubbing of Knock-out round and League round fixtures or vice versa. This type of tournament is beneficial when there is large number of teams or participants; from different region or areas; venues are at different places or zones. Same steps are followed as in Knock-out and League fixture. Its types are :

***(a)* Knock-out cum League :** In this the first phase is of Knock-out round and top few teams of knock-out then play League round.

***(b)* League cum Knock-out :** In this the first phase is of League round and top few teams of league then play Knock-out round.

Example 9. Knock-out cum League fixture of 20 teams (Combination Type) :

The teams will play first phase in Knock-out then in League round. Thus, teams are divided into four groups for Knock-out round (Group A, Group B, Group C, Group D and top team of each group will qualify for League round). Accordingly the winner is decided.

No. of matches in Knock-out round = 16; and No. of matches in League round = 6

Thus, total No. of matches = 16 (Knock-out) + 6 (League round) = 22

In Group A : 5 teams (1 to 5)

No. of matches = 4

No. of Byes = 8 – 5 = 3 Byes

Let the winner of Group A is 3

In Group B : 5 teams (6 to 10)

No. of matches = 4

No. of Byes = 8 – 5 = 3 Byes

Let the winner of Group B is 7

In Group C : 5 teams (11 to 15)

No. of matches = 4

No. of Byes = 8 – 5 = 3 Byes

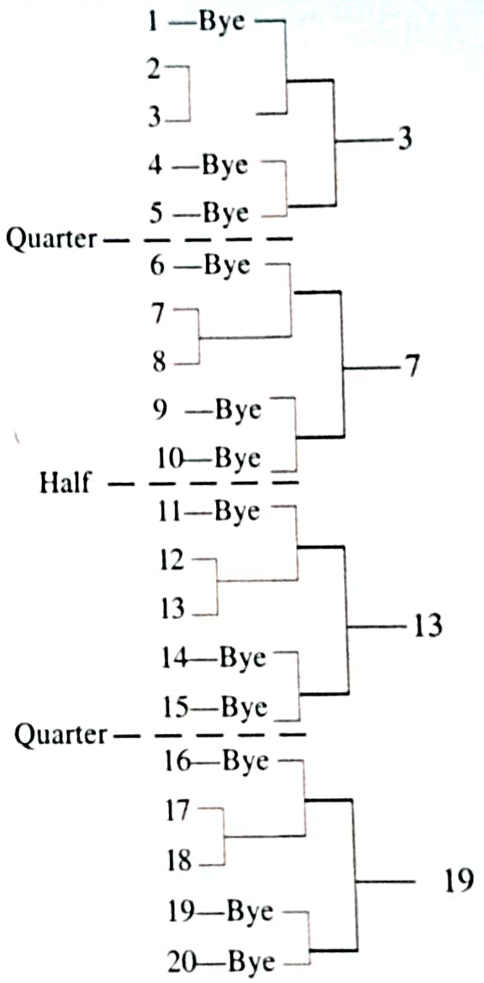
Let the winner of Group C is 13

In Group D : 5 teams (16 to 20)

No. of matches = 4

No. of Byes = 3 Byes

Let the winner of Group D is 19



In League round, the Top/Winner of each group will play (3, 7, 13, 19).

No. of matches in League round = $\frac{4 \times 3}{2} = 6$

League Round		
Round I	Round II	Round III
3 – 19	3 – 7	3 – 13
7 –13	13 – 19	19 – 7

Example 10. League cum Knock-out fixture of 22 teams (Combination Tournament) :

Teams are divided into four groups. Top two teams of each group will qualify for Knock-out fixture and compete for final.

Group A : Teams are 1, 2, 3, 4 and 5

Bye—5	Bye—1	Bye—2	Bye—3	Bye—4
1—4	2—5	3—1	4—2	5—3
2—3	3—4	4—5	5—1	1—2

Let top two teams of Group A are 2 and 5.

No. of matches in Group A = $\frac{5 \times 4}{2} = 10$

Group B : Teams are 6, 7, 8, 9 and 10

Bye—10	Bye—6	Bye—7	Bye—8	Bye—9
6—9	7—10	8—6	9—7	10—8
7—8	8—9	9—10	10—6	6—7

Let top two teams of Group B be 8 and 10.

No. of matches in Group B = $\frac{5 \times 4}{2} = 10$

Group C : Teams are 11, 12, 13, 14, 15 and 16

11—16	11—12	11—13	11—14	11—15
12—15	13—16	14—12	15—13	16—14
13—14	14—15	15—16	16—12	12—13

Let top two teams of Group C be 12 and 15.

No. of matches in Group C = $\frac{6 \times 5}{2} = 15$

Group D : Teams are 17, 18, 19, 20, 21 and 22

17—22	17—18	17—19	17—20	17—21
18—21	19—22	20—18	21—19	22—20
19—20	20—21	21—22	22—18	18—19

Let top two teams of Group D be 18 and 19.

No. of matches in Group D = $\frac{6 \times 5}{2} = 15$

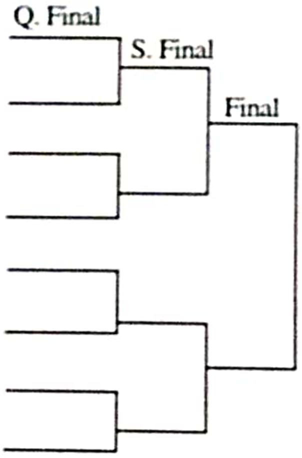
No. of matches in League Round = 10 + 10 +15 + 15 = 50

No. of matches in Knock-out Round = (8 – 1) = 7 (to get top team)

Total No. of matches = 50 (League round) + 7 (Knock-out round) = 57 matches

Then in Knock-out fixture top two teams of each group will compete.

(Top position team in Group A)	2
(Second position team in Group C)	15
(Second position team in Group D)	19
(Top position team in Group B)	8
(Top position team in Group C)	12
(Second position team in Group A)	5
(Second position team in Group B)	11
(Top position team in Group D)	18



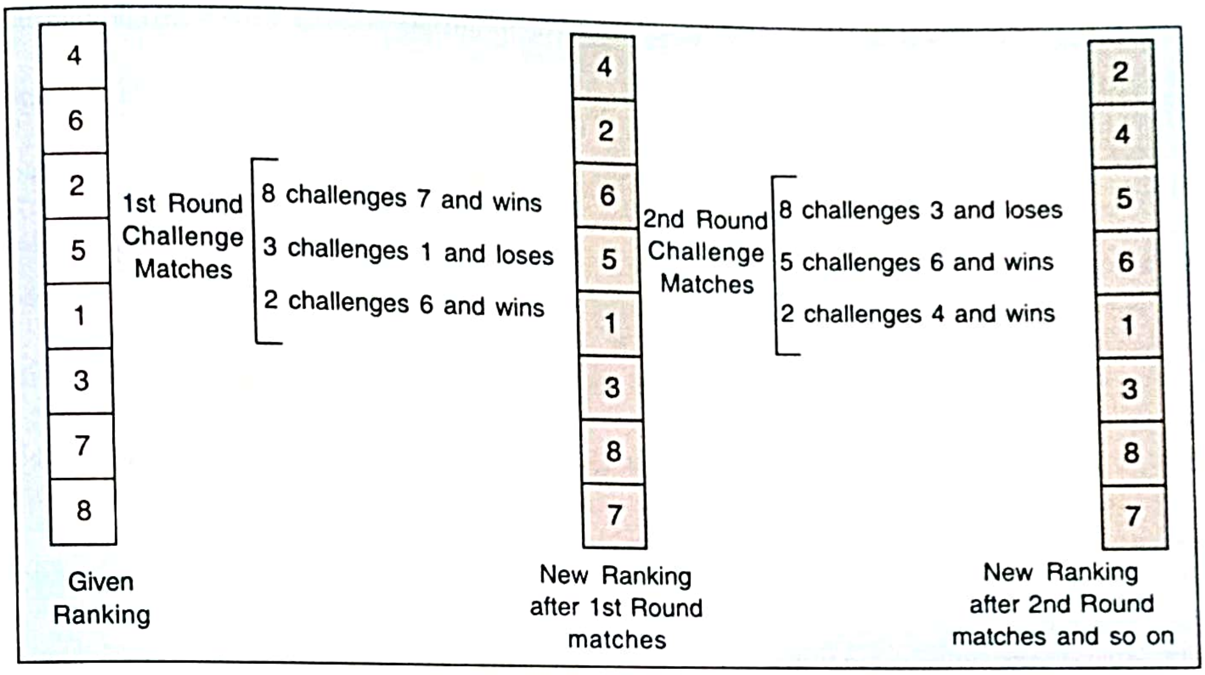
CHALLENGE OR LADDER TOURNAMENT PROCEDURE

This type of tournament is used to give ranking. If a team or player is not satisfied by their ranking they have to challenge upper ranked team/player and has chance to replace. A team or player has to proceed step by step to improve their ranking. Its types are :

(a) Ladder Challenge : In this, a team/players are given ranking from their previous performance. If any player is unsatisfied with their ranking, then the unsatisfied team or player can challenge the higher ranked player and replace the ranking if he wins. A player cannot jump ahead to challenge top ranked player, he has to proceed step by step in the given time of tournament.

(b) Pyramid or web/cobweb Challenge : In this type of tournament, there are many players at same ranking. If they have to improve their ranking; they have to compete with all other players at same ranking.

Example of Ladder Tournament :


4
6
2
5
1
3
7
8
Given Ranking
1st Round Challenge Matches
8 challenges 7 and wins
3 challenges 1 and loses
2 challenges 6 and wins
4
2
6
5
1
3
8
7
New Ranking after 1st Round matches
2nd Round Challenge Matches
8 challenges 3 and loses
5 challenges 6 and wins
2 challenges 4 and wins
2
4
5
6
1
3
8
7
New Ranking after 2nd Round matches and so on

5. INTRAMURAL AND EXTRAMURAL TOURNAMENTS

(A) INTRAMURAL TOURNAMENTS

The word 'Intramural' is a combination of two Latin words 'Intra' means Inside and 'Mural' means Walls. It is the competition 'Within the Walls'. Thus, Intramural means the competition conducted within players of one single Institution / School / College / Community etc. The motive of Intramural activities is to bring mass participation, developing the interest towards physical activities, to develop overall personality and developing the caliber of organizing skills in etc.

Intramural Tournaments

In these activities, the students of the institution are divided into various groups known as houses. It may be divided according to classes/hostels/ residents etc. In this the students compete for various activities of intramural in their houses within the campus. Intramural may be for one activity or many activities.

The factors which influence intramural activities are like need and condition of institution; facilities or resources available; funds available, students zeal for competition; teachers interest etc.

Common Intramural Activities	
Team or Major Games	Volleyball, Basketball, Football, Handball, Cricket, Kabaddi, Kho-Kho etc
Individual or Minor Games	Badminton, Tennis, Table Tennis, Chess etc
Combative Games	Judo, Wresting, Boxing, Karate etc.
Individual Sports	Athletes, Swimming, Shooting, Diving, Weight-lifting Gymnastics etc.
Group or Rhythmic Sports	Marching, Cross-country, Group dance, Mass PT, Tug of war etc.

Objectives of Intramural Tournaments

(i) To bring Mass Participation : The prime objective of intramural is to bring mass participation in the activities.

(ii) To Identify Talent : One of the objectives of intramural is to identify the new talented students for the activities.

(iii) To Create Interest : Intramural develops and creates the interest in students towards physical activities moreover to give knowledge about the activity.

(iv) To Develop Overall Personality : It develops the overall development of the students.

(v) Provides Opportunity to Compete in Controlled Environment : It provides healthy and controlled environment to compete and show their talent or skills.

(vi) To Develop Organization Skills : It develops good organization skills and leadership ability among students.

(vii) To provide Recreation : Intramural activities help to recreates and refreshes them.

(viii) To Develop Social Value : It develops social values like cooperation, friendship, togetherness, sportsmanship qualities, discipline, fair-play, patience, team work etc.

(ix) To Improve Health : It provides healthy environment to develop good health, fitness and wellness through its activities.

(x) To bring Creativity : Intramural activities provide good opportunity to show creative ideas and gain experience.

Significance of Intramural Activities

(i) Provides Opportunity : It provides good opportunities and chance to every student to participate and compete in activities of their interest.

(ii) Develops Interest : Intramural activities develop interest among students to participate in multi activities.

(iii) Healthy Competition : It provides a good and healthy atmosphere to participate and compete for physical activities; moreover, it also has recreational values.

(iv) Develops Social and Moral Qualities : Intramural to develops social values like the spirit of togetherness, sportsmanship, sports ethics, cooperation, friendship, discipline, fair-play, patience, team work etc.

(v) Builds Leadership Qualities : It develops leadership abilities among students and gives lot of chances to improve further.

(vi) Develops Talent : It helps the students to know their talent and motivate themselves to improve further, it also provides good opportunity to show creative ideas and gain experience.

(vii) Organizational Ability : It gives experience to students to organize and administer the programs with new ideas.

(viii) Opportunity for Extramural : It provide good opportunity for getting selected for extramural activities; thus it helps teachers or coaches to select and screen good players for extramural competitions.

(ix) Better Coaching : New talented player gets noticed by teachers which can be further trained for extramural activities by getting good chance in intramural activities.

(x) Develops Overall Personality : It develops the overall development of students through its activities.

(B) EXTRAMURAL TOURNAMENTS

The word 'Extramural' means the activities performed outside the walls of institution. These are the competitions at inter institutional / District / State / Cluster level etc. Extramural activities are played at various levels like Inter-School, Inter-District, Inter-State, Cluster, Regional, National and International levels. The motive of Extramural activities is to find the talented players and to give exposure to good players at higher levels. Extramural activities are the index and prestige of the institution.

Objectives of Extramural Tournament

(i) To Achieve High Performance : Extramural provides high performance and achievement to the player so that he can to excel at National and International level.

(ii) To provide the Feeling of Integration : It provides the feeling of integration to do collective effort for success.

(iii) To Provide Career in Sports : It provides good career in sports.

(iv) To Motivate : Extramural motivates the junior or upcoming player to excel in sports.

(v) To Provide Good Status : It provides good status of player in society.

Significance of Extramural Activities

(i) Progression in Performance : For extramural activities during training the systematic and sufficient practice is given under the guidance of good coach / coaches; this improves the performance of the player.

(ii) Improves Fitness : High level of fitness develops due to extramural activities.

(iii) Motivate to Improve Further : High competition is always a motivating factor to give better and better performance thus high perfection is gained.

(iv) Recognition : Good performance in extramural activities provides high recognition in society.

(v) Good Group Cohesion : It provides good group cohesion, understanding and bonding among team member.

(vi) Improves High Level of Social Qualities : It develops high level social qualities like togetherness, cooperation, friendship, tolerance, discipline, fair-play, patience, team work, sports ethics, sportsmanship qualities etc.

(vii) Improves Personality : Extramural activities helps to develop all-round personality factors.

(viii) Improves Knowledge about Games : It improves the knowledge about game, its training and coaching skills.

6. COMMUNITY SPORTS PROGRAMMES (SPORTS DAY, HEALTH RUN, RUN FOR FUN, RUN FOR SPECIFIC CAUSE AND RUN FOR UNITY)

Specific sports programmes are those programmes which are often not related to the competition. These programmes are designed with multiple objectives with their focus on well-being of an individual. The aim of programme is to create social awareness among the common people regarding unity and integrity, prevention and protection against various diseases etc.

Health is man's biggest asset. Man cannot progress or prosper unless he possesses good health. The health can be improved through various activities of physical education. Earlier participation in these physical activities was limited for few people but nowadays participation in these activities has widely increased for every member of society.

Today there are various forms of physical activities which are participated at mass level involving large number of local people. **These specific sports programmes are like Annual Sports Day, National Sports Day, Cross Country, City Marathon, City Run, Run for Fun, Run for Unity, Run for Awareness, Run for Specific Cause, Run on Special Day, like AIDS Day (1st December), Cancer Day (4th February), Women Day (8th March), Children Day (14th November), Health Day (7th April) etc. Basically the purpose of these specific programmes is to enhance good health, and fitness along with awareness for specific cause for the benefit of society.**

SPORTS DAY

It is organized in an institution once in a year to improve the all round development of children. It is considered as showcase for showing the children performance. It includes various physical and recreational activities. Sports day provide ample opportunities to students to participate in the activities of their choice. Major focus should be maximum encouragement and involvement of students, parents, teachers and other stakeholders. Many students get good experience of organization and administration. **The Government of India as well as many institutions celebrates 'National Sports Day' on 29th August on the birth anniversary of legendary hockey player Major Dhyan Chand.**

HEALTH RUN

Health Run are organized by many institutions, NGO's, Sports or Health department conducts 'Health Run' to spread awareness about health and fitness and to raise funds for charity. People of various age groups can participate in it by getting themselves registered in advance.

RUN FOR FUN

This programme creates awareness among people to keep themselves fit and healthy. There is fun and frolic while on run; there is no competition. It is commonly organized to raise funds for charity.

RUN FOR UNITY

This programme inculcate unity, peace and harmony among people. Its purpose is to develop togetherness, brotherhood and national integrity. It mostly have long distance relay events or races to promote collective efforts.

Run For Unity

DO A FAVOUR
Avoid Child Labour

RUN FOR SPECIFIC CAUSE

This mass programme is organized to bring awareness in society related to specific cause like AIDS, Cancer, Educating Girl, Stop Child Labour, etc.

FACTORS FOR SPECIFIC SPORTS PROGRAMMES

These specific sports programmes are not an easy task to organise as they require a lot of planning and good organization. The following factors should be considered during planning of these specific programmes :

(i) Purpose of Programme : The purpose of the programme should be made clear to all, i.e. what it will serve to society etc.

(ii) To Decide Date and Venue : The date, day and venue of the programme should be decided well in advance. Special day should be preferred for Specific Awareness Run, etc.

(iii) Chalking out Schedule : A good planning is required while chalking out the schedule and timing of the programme like assembly and dispersal point, opening and closing timing, etc. for participants, etc.

(iv) Path for Event : The path for running or course of track should be decided after considering the distance and safety factors of the path.

(v) Arranging the Requirements : Proper consideration should be given while arranging the requirements for this programme.

(vi) Making the Budget : After chalking out the programme the budget for the event should be made and sufficient funds should be arranged.

(vii) Information to Participants : Good planning is required to bring maximum participation for the programme. Help can be taken from media for its publicity. Tentative strength should be considered for event. The participants must be informed about rules and regulations of the event.

(viii) Safety Arrangements : Proper planning should be made regarding the safety arrangements of participants like help from traffic police, diversion of traffic, assistance from police, other volunteers' help, etc.

(ix) Check over Participants : Adequate planning should be made to check and control the participants. They must be guided and directed properly at different points. If possible the participants should wear dress code or specific kit for the event.

(x) Facilities for Event : The needful facilities should be provided to participants like safe water arrangement at different points, refreshment, medical aid for injured person, recovery van, etc.

(xi) Reward to Winners : Reward should be given to position holders whereas other participants should be encouraged and motivated to perform better.

(xii) Safe Dispersal : In the end of the programme, the organizers should see the safe dispersal of participants.

Some Important Questions

Multiple Choice Questions (MCQs)

1. Which of them are part of Sports Management ?
   (*a*) Planning (*b*) Organizing and Staffing
   (*c*) Directing and controlling (*d*) All of the above
2. Pre works of Organising Secretary are
   (*a*) Good Planning (*b*) Staff grouping and their Cooperation
   (*c*) Raising Funds (*d*) All of the above
3. Tournament Technical Committee works are
   (*a*) To look after the stay arrangements of players. (*b*) To provide transportation to the players.
   (*c*) To conduct matches as per rules of the game. (*d*) To provide first-aid to the players during match.
4. In Knock-out tournament team has to
   (*a*) Play large number of matches (*b*) Play one match
   (*c*) Gets Bye (*d*) Play till they are winning
5. Bye is given when
   (*a*) There is large number of teams. (*b*) League tournament.
   (*c*) Advantage to play in second round. (*d*) There is odd number of teams.
6. The number of matches in Round Robin Tournament is where 'N' is number of teams.
   (*a*) $\frac{N(N-1)}{2}$ (*b*) $N-1$ (*c*) $\frac{N-1}{2}$ (*d*) N

UNIT 2

CHILDREN AND WOMEN IN SPORTS

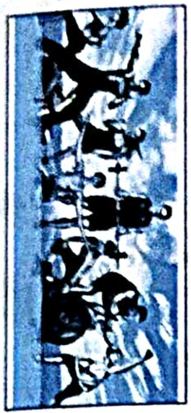
TOPICS & LEARNING OUTCOMES

1. **Exercise guidelines of WHO for different age groups : To make students understand the exercise guidelines of WHO for different age groups.**
2. **Common Postural Deformities - Knock Knees; Flat Foot; Round Shoulders; Lordosis; Kyphosis; Scoliosis and Bow legs and their respective corrective measures : In this we understand about good posture; various postural deformities ; their causes and their corrective exercises.**
3. **Women's participation in Sports – Physical, Psychological, and social benefits: To make students aware of women's sports participation in India and about the special conditions of women.**
4. **Special consideration (Menarche & Menstrual Dysfunction) : It gives us knowledge about women physiological changes during Menarche & Menstrual Dysfunction and activities.**
5. **Female Athlete Triad (Osteoporosis, Amenorrhea, Eating Disorders) : This topic helps us to understand the female problems during sports activities.**

1. EXERCISE GUIDELINES OF WHO FOR DIFFERENT AGE GROUPS

Growth Stage & Age Group	Main Characteristics	Exercise Guidelines/ Physical Activity	Sleep and Other Requirements
Babyhood (from Birth to 1 year) 	Motor development starts after birth and follows progressive and sequential patterns from top to bottom. The baby firstly learns to move but control is missing i.e. gross motor development take place. It happens primarily at neck, shoulders, arms, hands, legs. Fine motor development is missing.	Physical activity of at least 30 minutes is required. Activities like crawling, sitting, standing etc. are gained in this stage.	Sleep of at least 14 to16 hours is recommended by the experts. Parents should provide healthy diet, clean and safe environment. Proper vaccination and immunization should be done.

ancy (from 1 to 3 years) 	In this stage, gross motor development is of main concerned. Parents should provide healthy diet and playful environment for gross motor development. Parents should consult expert to note the growth and development of child.	Physical activity of at least 1 to 2 hours is required. Activities like sitting, standing, walking, rolling, bending, stepping, block building, etc.	Parents should provide healthy diet, clean and safe environment. The sleep requirement recommended by the experts in this stage is 12 to 14 hours. Proper vaccination and immunization should be done.
Early Childhood Growth and Development (3 to 6 years). 	In this age, the main concern is to develop gross motor components along with fine motor components. The children should be provided healthy playful area and special care should be given to diet, environment, their habits, moral values, recreational activities, etc.	Physical activity recommended should be 2 to 3 hours in one or two sessions; where the intensity should be from moderate to vigorous activities to develop neuro-muscular coordination and aerobic capacity in children. Activities like running, throwing, kicking, catching, tri-cycle ride, ladder climbing, hopping, climbing, wide stepping etc., are helpful. The recreational activities with ball, hopping, rope jumping, fun games; callisthenic, PT exercises, etc. develops good coordinating in this age group.	10 to 12 hours sleep is recommended by the experts.
Later Childhood Growth and Development (7 to 17 years) 	In this stage of childhood, gross and fine motor development activities are developed along with fitness. Group cohesion, friendship bonds and habits formation comes in this stage thus, good friend, healthy hygienic habits should be motivated. As this is fast growing stage thus good and healthy diet (more amount proteins) should be provided.	In this age, the main concern is to develop fine motor components especially endurance, flexibility and coordinative ability. Physical activity reco-mmended should be 3 to 4 hours in one or two sessions; where the intensity should be from moderate to vigorous activities in children. Activities like Yoga asanas, Gymnastics, Athletic, Swimming etc are good sports activities for this age group. Recreational ball games and games like Football, Basketball, Handball, Volley-ball, etc. are helpful. Racket games like Badminton, Table Tennis, and Tennis also help to develop fine motor development skills.	At least 9 to 11 hours sleep is recommended by the experts.

Adolescence, Youth and Adult Growth and Development (from 18 to 64 years) 	Adolescence is the delicate period and a challenge for parents. Physical, social and psychological changes are prominent in this stage. Adolescents and youth need good diet and heavy physical workout activities thus strengthening and endurance activities are helpful. Teenager should be motivated to develop moral values, controlling their emotions, proper use of finances, etc.	In this age, the main concern is to develop all motor components. Physical activity recommended should be 3 to 4 hours in one or two sessions in a day; where the intensity should be from moderate to vigorous activities to develop all motor components. Almost all games sports and adventurous activities are helpful in this stage.	At least 7 to 9 hours sleep is recommended by the experts.

2. COMMON POSTURAL DEFORMITIES

GOOD POSTURE AND ADVANTAGES

Posture is the specific body position. It may be static or dynamic such as sitting, standing, lying, walking, running, reading, etc. There are different views about posture.

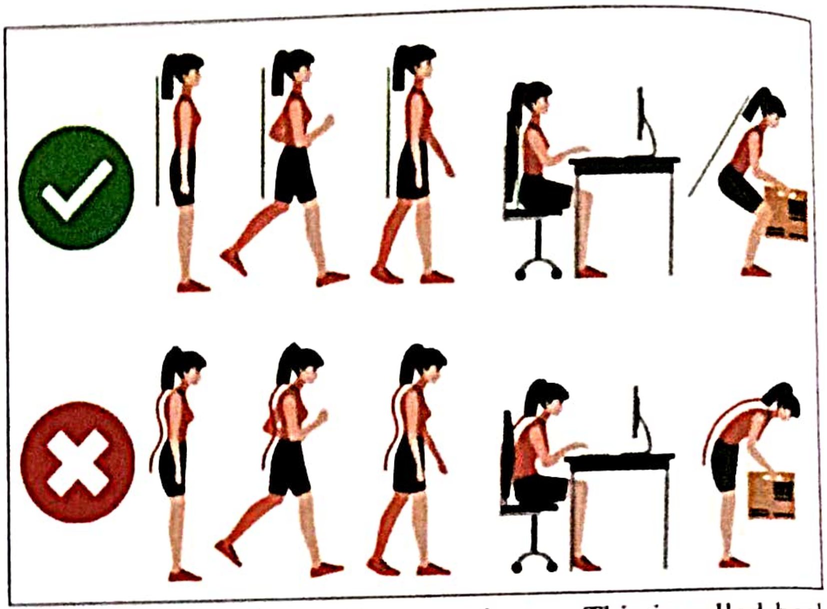
According to Physical Educationists, "Posture is a tool of mechanical efficiency of body which causes minimum stress to muscles. Moreover, maximum output of physical efficiency can be attained".

According to Doctors, "Posture is soundness of physiological balance of the body."

According to Actors, "Posture is a tool to express emotions and attitude."

From the above we can conclude that good posture helps the body to function efficiently and effectively. Good posture reflects the personality of an individual. Moreover, it shows the expressions, emotions and attitude of mind. Thus, posture is more than just the physical condition of an individual. Correct or good posture is the position of body held without any sense of effort. The efficiency of body depends upon good posture. It is directly related to the health status of an individual. By adopting the correct posture, the various organs of the body get rest, the body does not get easily tired and the person remains in sound health. Good posture keeps our bones in their natural shape and in proper alignment. **Posture may be Static (sitting, standing, sleeping, etc) or Dynamic (walking, running, bending, playing, working etc).**

Correct Standing Posture : Standing is one of the most common activities which has improved the human race from quadruped (four legs) to biped (two legs). It provides static and dynamic actions to human. The correct standing posture is held without any sense of effort. Standing is a position in which the body is held in upright position and supported only by the feet. **In correct standing posture, feet apart about 4 to 6 inches (roughly shoulder width). Feet should be parallel to each other and balanced evenly on both feet. One should stand straight and erect.** Hold the head straight, chin parallel to floor, keep shoulder, hips and knees in straight line. Body weight on both legs and evenly balanced. From side view ear, shoulder, hip, knee and ankle should be centred along an imaginary straight line. The Centre of Gravity (C.G.) should be with the centre of feet.



Correct Sitting Posture : Sitting is also one of the common activities in which most of our time is spent. **In correct sitting posture, the backbone should be correct so that natural curve should be visible. The upper region of the backbone should be straight against the back of the chair. Head should be in line with hip and shoulder.** The arms should be balanced and the waist should touch the back of chair. The thighs should be in straight line resting on the seat of chair and legs should rest vertically on feet.

Correct Walking Posture : In walking posture feet stretches, pushes the ground and then the weight is transferred on the toe. This is called heel toe action. Walking should look smooth, efficient and graceful.

ADVANTAGES OF CORRECT POSTURE

***(i)* Attractive Physical Appearance** : The first image of personality comes through good posture. A good posture makes individual appear smart, good looking, charming and attractive.

***(ii)* Improves Health Status** : Correct posture of body reflects positive health status of an individual. Good posture is an image of good health and sound body.

***(iii)* Psychological Balance** : A good posture improves the psychological balance of the body and mind. It improves the activeness of mind and leads to its optimum development.

***(iv)* Lesser Strain and Pain Over Joints** : Good posture causes less strain and pain over joints as it distributes the body weight equally over the joints.

***(v)* Improves Social Status** : A good physique reflects positive social qualities. Good posture is an image of happy lifestyle and social well-being of an individual.

***(vi)* Better Functioning of Body Systems** : Various systems of body get full chance to function well if good posture is maintained. It provides optimum functioning of internal organs.

***(vii)* Prevents Fatigue** : Good posture helps to prevent fatigue, thus provides productivity in work. It also improves physical balance.

***(viii)* Improves Appetite** : Good posture increases the appetite. Thus, health status is improved; moreover, it causes less pressure over abdomen. Thus, digestive organs function properly.

***(ix)* Reduces Postural Deformities** : Correct posture helps to prevent postural deformities. Thus, health problems are reduced like Kyphosis, Lordosis, Scoliosis, Knock-knees, etc.

***(x)* Better Skill Perfection** : Good posture helps to improve skills. Thus, more perfection in activity. It makes the movements graceful.

***(xi)* Better Selection of Players** : Correct posture of players helps coaches and teachers for better selection of players for various activities.

***(xii)* Optimum Physical Efficiency** : Good posture provides optimum opportunity to an individual to improve physical efficiency and fitness.

***(xiii)* Good Body Balance** : Correct posture provides good body balance, thus more stability of individual while performing workout.

CAUSES OF BAD POSTURE

There are many causes of bad posture. Some are environmental causes and others may be due to heredity. Bad posture causes many health problems. It reduces the physical output or efficiency to a great extent. It leads to psychological stress, bad looking, less social acceptance, etc. It is a major cause of many postural problems like Kyphosis, Round shoulders, Lordosis, Scoliosis, Knock-knees, Bow legs, Flat-foot, etc. Bad posture can easily be corrected and prevented if early steps are taken. Some of the general causes of bad posture are given below :

(*i*) Accident or Injury : Sometimes bad posture arises due to accidents. It may cause postural deformity.

(*ii*) Disease : Many kinds of health problems like diseases, illnesses and chronic sickness cause bad posture.

(*iii*) Lack of Nutritional Diet : Sometimes bad posture arises due to unbalanced diet, over-diet, under-diet and lack of nutritional diet.

(*iv*) Heredity : Heredity is an important cause for postural deformity.

(*v*) Wrong Postural Habits : The wrong sitting posture or wrong postural habits during sitting, standing, lying, working, etc. cause bad posture.

(*vi*) Improper Treatment or Exercise : Improper treatment or wrong treatment for curing injury and sometimes wrong exercises also causes bad posture or postural deformity.

(*vii*) Psychological Stress : Psychological stress in life leads to mental tension, unbalanced emotions or behavioural changes. Sometimes it leads to postural deformity.

(*viii*) Lack of Sufficient Strength : The poor muscular strength or the unbalance strength of antagonist and antagonist muscles cause postural deformity.

(*ix*) Age Factor : In old age the muscular strength reduces. Thus, bad posture may arise.

(*x*) Poor Eyesight : Poor eyesight causes strain over head and neck. Thus, body bends forward and it may cause bad posture.

(*xi*) Bad Shoes or Clothing : In some cases, bad posture arises due to poor quality shoes or clothing.

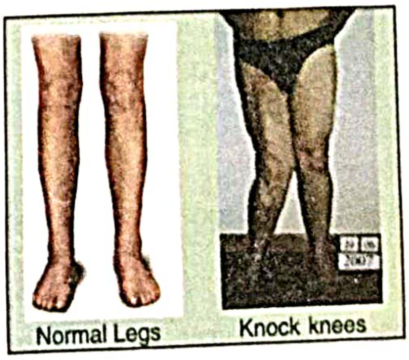
(*xii*) Obesity : In some cases obesity is one the cause of bad posture.

POSTURAL DEFORMITIES AND THEIR CORRECTIVE MEASURES

There are many types of postural deformities like Kyphosis, Lordosis, Scoliosis, Knock-knees, Bow legs, Flat-Foot, etc. These postural deformities reduce the efficiency of individual to great extent and cause many more health problems. These can easily be corrected or prevented if early steps are taken. There are many types of corrective asanas and exercises which are helpful to correct these postural deformity.

(A) KNOCK-KNEES

It is also known as Genu Valgum. Knock-knees is the postural deformity of legs where legs are bent inward and knees touch or strike each other while walking or running, i.e., knees touches or overlap each other in normal standing position. In Knock-knees problem, the knees join together while there is wide gap between the ankles varying directly with the degree of deformity.



Causes : The main causes of Knock-knees are Rickets, deficiency of vitamin D, weak legs, obesity during childhood, Calcium deficiency, injury, stiff joint, knee pain, heavy weight lifting in childhood stage, etc.

Corrective Measures :

(i) **Yoga Asana like : Vriksh Asana, Akarn Dhanur Asana, Padma Asana, Gomukh Asana.**

(ii) **Pillow Exercise :** In this pillow is kept between legs and person presses the legs.

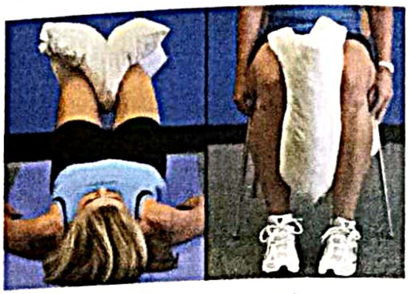
(iii) **Outward Toe Walking :** In this person tries to walk over the outer edges of foot while the inner part of sole is raised up.

(iv) **Horse Riding :** Riding on horse or similar type of activity by which we keep the knees wide thus it corrects the knock knees.

Vriksh Asana

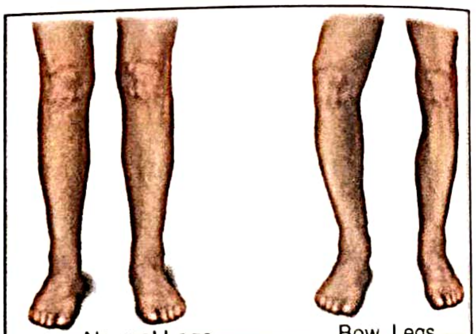
Akarn Dhanur Asana

Padma Asana


Pillow Exercise

(B) BOW LEGS

This deformity is also known as Genu Varum or Pigeon Toes. This is the defect of legs in which legs bend outward. In this the legs curve outward at the knees while the feet and ankles touch. The space between knees widens up and legs take curve shape. Bow legs cause lot of pressure over the lateral edges of feet.


Normal Legs Bow Legs

Causes : The main cause of Bow legs deformity are Rickets, Arthritis, Blount disease, deficiency of Vitamin D, Calcium, Phosphorus in diet, early childhood walking with weight, obesity, defaulted footwear, etc.

Corrective Measures :

(i) **Yoga Asana Like : Ardha Chakra Asana, Garud Asana, Ardha Matsyendra Asana etc.**

(ii) **Walking with Inward toe :** In this person tries to walk with inner edges of the foot while the outer edges of sole are raised.

(iii) **Special Shoes :** Special shoes helps to correct bow-legs.

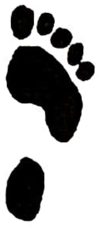
Ardha Chakra Asana

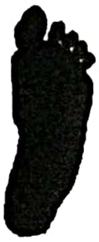
Garud Asana

Ardha Matsyendra Asana

(C) FLAT-FOOT

It is also known as Pes Planus or Fallen Arches. Flat Foot is an abnormal condition of foot in which the arch of the foot collapses, with the entire sole of the foot coming into complete or near complete contact with the ground, *i.e.* no arch in the foot and the foot is completely flat. In this default of feet, person gives complete print of their foot sole over the plane surface (walking barefooted). In flat foot, the inner


Normal Foot Print


Flat Foot Print

Flat Foot

curve of foot bulges more than normal. Arches provide a spring to the step and help to distribute body weight across the feet and legs. Arches need to be both sturdy and flexible to adapt to stress and a variety of surfaces. When people have flat feet, it affects their posture while standing, their walking, running, and other related performances.

Causes : The main causes of Flat foot are wearing flat slippers or shoes, improper shoes, poor quality shoes without sole curves, obesity and overweight, prolonged standing, weak muscles of foot, tarsal coalition, old age, etc.

Corrective Measures :

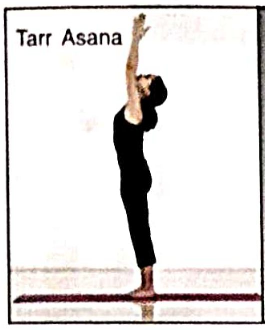
(*i*) **Yoga Asana like :** **Tarr Asana, Vajra Asana**

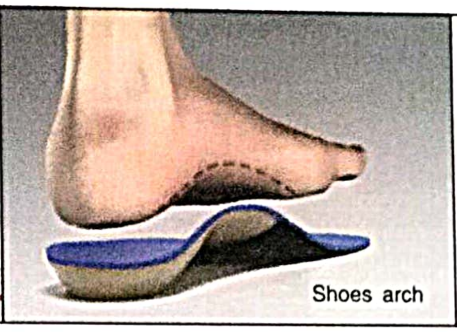
(*ii*) **Walking on Sand :** The person is told to walk barefooted over the sand.

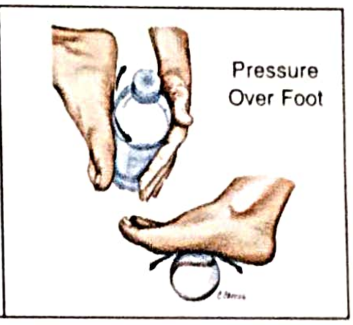
(*iii*) **Regular Running:** The person is told to run fast over on toes on clean surface.

(*iv*) **Using Good Quality Shoes:** Person is told to wear good quality shoes with inner curve on sole.

(*v*) **Skipping:** Person with flat foot should perform skipping regularly.



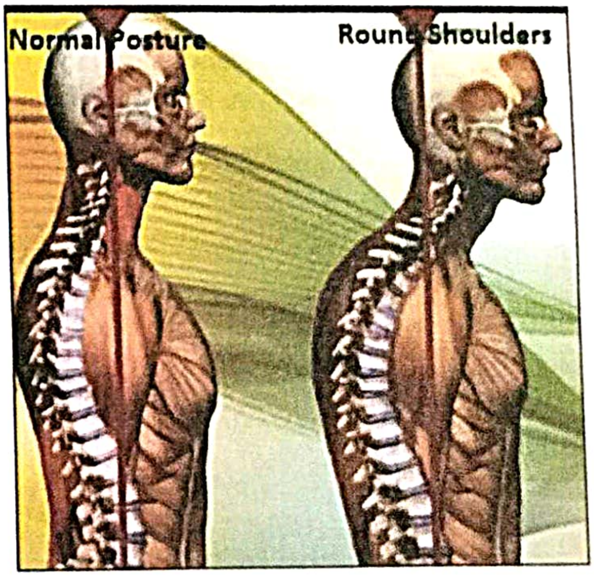




(*vi*) **Pressure Over Foot:** Flat-Footed person is to give pressure over the foot while toe and heel are at sides.

(*vii*) **Writing with Foot :** Person is told to practice writing with foot or to pick up marbles with foot.

(D) ROUND SHOULDER



It is the postural defect in which shoulders become round and sometime they are projected upward and forward, *i.e.* shoulders are bent upward and forward. In this shoulders are bent forward from the ideal alignment, thereby giving a narrow curve to upper back. It leads to postural deviations such as hyper-kyphosis, or hunch back and anterior head carriage, or forward head posture. The chin is downward and head is bent forward. This gives the round shape of shoulder.

Causes : The main causes of this deformity are like heredity, chronic neck pain or neck spondylitis, poor postural habits (wrong posture during reading or writing over chair or bed, using excessive smart-phones or tablet), carrying overloaded school bag by children, wearing tight fitted clothes, weak muscles of chest and shoulder, faulty furniture etc.

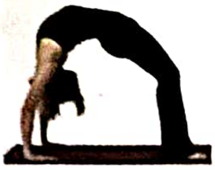
Corrective Measures : There are many types of asanas and exercises which can cure the postural deformity of Kyphosis and Round Shoulder. They are mostly backward bending asanas or exercises.

(i) Yoga Asana like : **Chakra Asana, Dhanur Asana, Bhujang Asana, Ushtt Asana**

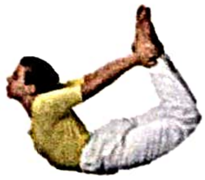
(ii) Backward Bending Exercises : All exercises of backward bending are helpful as corrective measure of Kyphosis like reverse sit-up; holding the hands at back and raising up; sit on chair; rest the back against it and pull the shoulders backward and look upward. From lying position the upper and lower body is raised up with support of hands. Body balances on the abdomen.

(iii) Strengthening Back Muscles by Reverse Sit up : Strengthening the back muscles near vertebral helps to correct Kyphosis and Round shoulder. From prolying position the upper part of body is raised up while looking up.

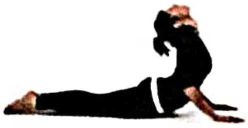
(iv) Using Flat Bed: Using flat bed and thin pillow while sleeping.



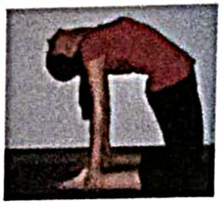
Chakra Asana



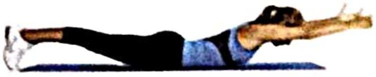
Dhanur Asana



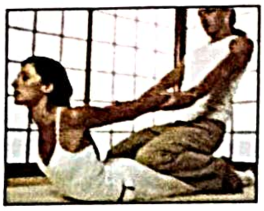
Bhujang Asana



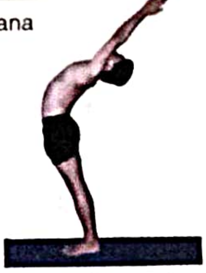
Ushtt Asana



Reverse Sit-up



Holding Hands at Back

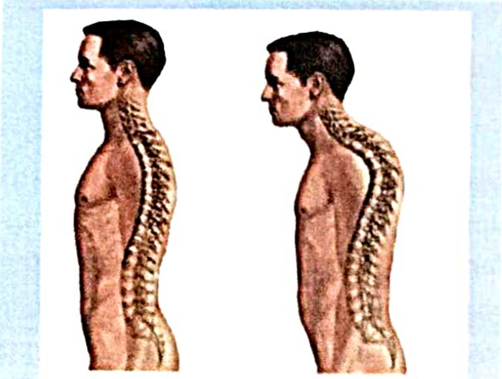


Backward Bending

(E) KYPHOSIS

It is also named as Hunch Back. In Kyphosis, the thoracic cage and clavicle spine (*i.e.* upper back spine) curvature increases. There is exaggeration curvature of upper back spine i.e., there is abnormal curvature of spine at back.

Causes : Kyphosis can occur due to heredity, aging, disease (arthritis, osteoporosis), malnutrition, pulling of heavy weight over a period, unstable furniture, poor postural habit, weakness in muscles etc. It can occur at any age but is most common in older women. Age-related kyphosis is often due to weakness in the spinal bones that causes them to compress or crack. Kyphosis can appear in infants or teens due to malformation of the spine or wedging of the spinal bones over time. It causes unbalanced position of individual during standing and lot of pressure over toes. This posture creates instability while walking, running etc. that may lead to fall or injury.



Normal Posture with Spine (side view)

Kyphosis Posture with Spine (side view)

Corrective Measures : In this problem backward bending exercises or asanas are done to overcome Kyphosis deformity.

(i) Yoga Asanas : Chakra Asana, Dhanur Asana, Bhujang Asana, Ushtt Asana

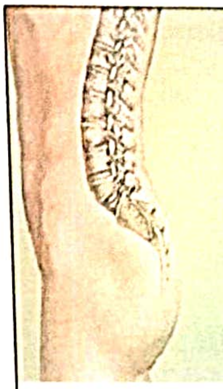
(ii) Backward Bending Exercise : See above Corrective Measures of Round shoulder.

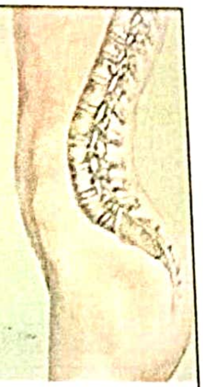
(iii) Strengthening of Back Muscles by Reverse Sit-up Exercise : See above Corrective Measures of Round shoulder.

(iv) Using Flat Bed during Sleep Exercise : See above Corrective Measures of Round shoulder.

(F) LORDOSIS

This problem is also known as Hollow Back. Lordosis is the problem of lumbar-spine. In this postural deformity the lumbar-spine bends in front beyond the normal level. It causes back pain. Lordosis is abnormal curvature of spine in front at lumbar spine. Thus, abdomen is ahead of body and shoulder comes outward and sideward. In Lordosis deformity, the body weight is shifted backward. Thus, lot of pressure is over heels.


Normal Posture with Spine (side view)


Lordosis Posture with Spine (side view)

Causes : The main causes of Lordosis deformity are like weak abdomen muscles, overweight or obesity, disease, accident, poor postural habits, malnutrition, sedentary lifestyle, etc.

Corrective Measures : In this deformity of lumbar-spine the body weight is shifted backward. Thus, all forward bending asanas or exercises are helpful for correcting Lordosis. Some of them are :

(*i*) **Yoga Asana : Paschimottan Asana, Hal Asana, Forward Bending, Trikon Asana etc.**

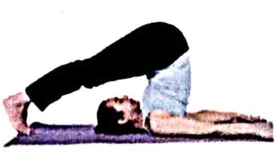
(*ii*) **Alternate Toe Touching** : In this feet apart and try to touch opposite hand to foot while other hand is raised up.

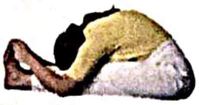
(*iii*) **Stoop Walking (Long Stride Walking)** : In this long stride walking is done while body is bent forward and downward. Other alternative is stepping over stairs.

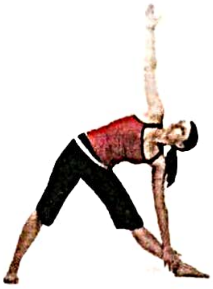
(*iv*) **Situps :** Regular exercise of sit up should be done to strengthen abdominal muscles.

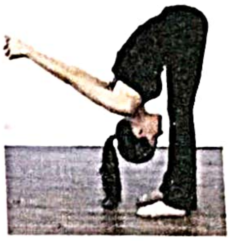
(*v*) **Balanced Diet :** Balanced diet should be taken and avoid junk food and high caloric food.

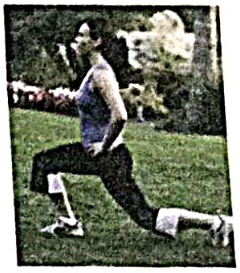
(*vi*) **Lying in Proline :** In this person lies with face down whereas abdomen and chest touch the surface. It is also known as Makra Asana.


Hal Asana


Paschimottan Asana

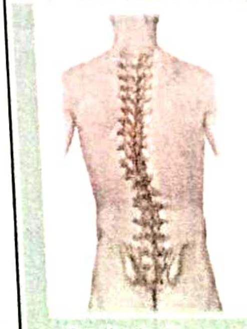

Trikon Asana

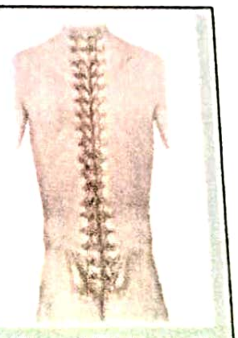

Forward Bending


Stoop Walking

(G) SCOLIOSIS

It is the problem of spine in which vertebral column bends to sideward i.e., exaggerated bent of spine to lateral curvature. Scoliosis causes one shoulder down and other is raised up. Body weight is shifted to sideward and it causes lot of pressure on one side of the foot. In this disorder, the spine bends, twists or rotates in a way that it makes a C or an S shape. Scoliosis is found more commonly in girls than in boys and, though it can occur at any age, but it is more common during the growth just before puberty.


Scoliosis Posture with Spine


Normal Posture with Spine (Back view)

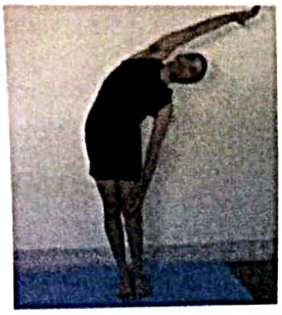
Causes : The main causes of Scoliosis deformity are differences in leg lengths; undeveloped legs or backbone, lifting weight towards one side of shoulder in routine, living in an unhealthy environment, and standing and sitting in a wrong posture etc. Scoliosis can be caused by conditions such as cerebral palsy and muscular dystrophy, or diseases like Arthritis, Paralysis, Rickets disease of backbone.

Corrective Measures : All opposite sideward bending exercises or asanas are helpful for correcting Scoliosis. Some of them are :

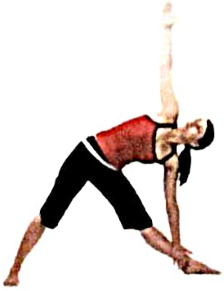
(*i*) **Yoga Asana like: Ardha Chakra Asana, Hast Asana, Trikon Asana, Tarr Asana etc.**

(*ii*) **Chin-ups :** In this body is stretched up over a horizontal bar while body weight hanging vertically and lifted up.

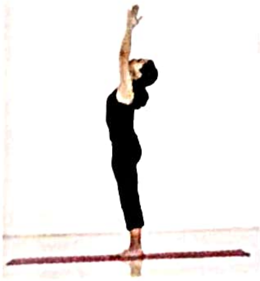
Ardha Chakra Asana (To opposite side)



Trikon Asana



Hast Asana



Chin-ups

3. WOMEN'S PARTICIPATION IN SPORTS

Women's participation in sports has a long history. There was an old belief that man is for market and woman is for home and family. It is a history marked by division and discrimination but also one filled with major accomplishment by female athletes. Women were often perceived as being too weak for sports activities and it was often argued in the past that sports was harmful to women's health, particularly their reproductive health. There is a rich record of sports participation of women in India. In Ancient Olympic Games, women were not allowed to participate but in Modern Olympic Games females are the active member (except in first Modern Olympic Games in 1896). In 1916, the Amateur Athletic Union conducted its first Women World Championship at London. Later, International Olympic Committee (IOC) designed and altered the rules and regulations of various games to encourage the participation of female athletes. Thus, the categories of female and male are separate for all games and sports.

Today, the modern society has accepted the women's participation in sports competition and it has risen to a great extent as compared in the past. Modern clinical studies have proved that physical activities have benefitted the health of women and it has also benefitted the society to a great extent. According to IOC data, the women participation at London Olympic Games has risen to 41% of all athletes. In Tokyo Olympics (2020) it rose to 49% of all athletes.

This trend of women participation in sports has also improved in Indian society and thus the women's participation in sports has increased. There is a rich record of sports participation of women in India. Currently, sports for women represent fast growing changing elements in Indian culture and recent trends have sparked a need for knowledge about female sports participation. In urban areas, female participation in sports is high whereas it is less in rural areas. Indian society should encourage their participation; moreover, government should form policies to improve their participation. Today, Indian society has recognised many of Indian Sports Women which are playing the role model and are changing the trend of women participation in games and sports. Some of top women athletes from India who have proved their sports ability at international arena are Mary Kom (Boxing), P.T. Usha, Anju Bobby George, K. Beenamol, Manjeet Kaur, Neelam J Singh, Geeta Jakhar, Dutee Chand, Hima Das (Athletics), Saina Nehwal, P.V. Sindhu, Jwala Gutta (Badminton), Sakshi Malik (Wrestling), Deepa Karmakar (Gymnastics), Anjali Bhagwat (Shooting), Sania Mirza (Tennis), K.Malleshwari, Kunjurani Devi, Mirabai Chanu (Weight Lifting), Dola Banerjee, Deepika Kumari (Archery), Mithali Raj (Cricket), Lovlina Borgohain (Boxing) and many more.

BENEFITS OF SPORTS PARTICIPATION TO WOMEN

We should give equal opportunity for our son & daughters to play sports so that they can derive their psychological, physiological and sociological benefits of sports participation. Sport has been one of the most important socio-cultural learning experiences for boys and men for many years. Sports participation of women play many important roles in the life of a woman. With sports she can built the following things:

(i) Confidence: The women who play sports have higher levels of confidence, self-esteem and lower levels of depression.

(ii) Positive Body Image: Girls and women who play sports have a more positive body image and experience higher states of psychological well-being than girls and women who do not play sports.

(iii) Achieve Goals: The girls who participate in games and sports can achieve their goals easily.

(iv) Learn how to deal with success as well as failure : Sports provide the experience to deal with day-to-day life problems; moreover provide confidence to deal with success and failure.

(v) Good Health: Games and sports make the body strong, fit and healthy. Moreover keep us away from health problems and diseases.

(vi) Graceful Movement: It develops good coordinative ability and agility thus graceful movement and actions.

(vii) Good Body Shape: Sports and exercise keep you trim and firm. Thus, improve the body shape or posture.

(viii) Control Anger and Anxiety: Exercise is the nature's best tranquilizer; it actually helps to keep you calm and cool.

(ix) Eat and Sleep Better: Participation in games and sports improve the diet of female thus proper nutrition and rest improves their every area of life.

(x) Overcome Shyness: The participation of female in sports help them to overcome shyness, they learn to be assertive and make decisions.

(xi) Career and Job: Participation of girls/women in games and sports provide the career and job opportunity to them, like coach, sports doctor, manager of a professional sports team, sports communication or marketing specialist, CEO of a sports trust, etc.

CAUSES OF LESS PARTICIPATION OF INDIAN WOMEN IN SPORTS

There are various causes or constrains of less participation of Indian women in sports. Some of the constrains are physical, physiological, psychological, social, religious, economical etc.

(i) Wrong Social and Cultural Traditions : In India, there are various traditions and many of them are old or ill like restraining girls from participation in sports. Indian society is male dominated. These male dominating traditions are followed strongly in Indian-society.

(ii) Lack of Family Support : Indian family has very strong bonds and they restrain women to go outside alone. Thus, Indian women do not get any support from their family to participate in sports.

(iii) Lack of Finances : Competitive games and sports are expensive, as player requires good diet, good equipments and proper training. Thus, lack of finances or lack of sponsors hampers the women to participate in competitive sports.

(iv) Over-Burdened with Household works : Indian women are over-burdened to perform the household works like cooking, cleaning, caring of children etc. Thus, they have no time to participate in sports.

(v) Fear of Sexual Harassment : Women face lot of sexual harassment when in public. Moreover, lack of public support has reduced the girls participation in sports.

(vi) Lack of Motivation at Institutions : Women are not motivated, rather discouraged at institutions to participate in sports.

(vii) Less Facilities for Girls : There are less facilities for girls, moreover, the women coaches are less. Thus, the girls do not feel comfortable to participate in sports.

(viii) Lack of Girl Safety : There are some countries in which girls are not safe as they face lot of problems like eve-teasing, unethical remarks, rubbish comments etc. This reduces the girls participation in sports.

(ix) Lack of Media Support : Many time media does not support the sports women and their hard work and their challenges.

(x) Lack of Girls Education : Lack of girls education is one of the factors for less participation.

(xi) Poor Implementation of Government Policies : There are many policies for girls but they are not implemented properly, thus it discourages girls participation in sports.

4.(A) MENARCHE

Menarche is the beginning of menstrual cycle or first menstrual bleeding in female. Menarche shows the girl's transition to womanhood, i.e. it is a sign of growing up of girl and becoming a woman. Menarche (first menstruation) is usually considered the point of sexual maturity for girls. It is the process in which female reproduction system matures and the body prepares itself for potential pregnancy. **Girls experience menarche between 8 to 15 years of age.** It is often considered the central event of female puberty as it signals the possibility of fertility. After the onset of menarche female experiences series of physiological and anatomical changes during puberty like attainment of sufficient body mass, secretion of estrogen by ovaries, gain in height, breast enlargement, widening of pelvis, growing of pubic hair, increase in adipose tissues, etc.

Causes of Early Menarche : Although the precise determinants of early menarche age remain to be understood, genetic influences, socio-economic conditions, general health and well-being, nutritional status, certain types of exercise, seasonality, and family size possibly play a role. Over the past century the age at menarche has fallen due to reasons still unknown. Increase incidence of childhood obesity; low birth weight; exposure to smoking (mother or girl); children not provided breast feeding; lack of exercise; inadequate diet; family conflicts causing stress over girls.

Activities During Menarche : The menarche is the normal physiological and anatomical phase in female. The research has proved that female can participate in moderate physical activity without any complications, whereas heavy training schedule of physical activity should be participated with care of personal cleanliness and hygienic factors. If complications arise during menarche due to physical activity, female should consult gynecologist or doctor.

4.(B) MENSTRUAL DYSFUNCTION

Menstruation (also termed as period or bleeding) is the process in a woman of discharging (through the vagina) blood and other materials from the lining of the uterus at about a monthly interval from puberty until menopause, except during pregnancy. This discharging process lasts about 3-5 days. Most of the menstrual cycle occurs after every 22 to 35 days Women usually have periods until about ages 45 to 55 and have menopause usually around age of 50. Menopause means that a woman is no longer ovulate and get pregnant. Like menstruation, age of menopause can vary from woman to woman and these changes may occur over several years.

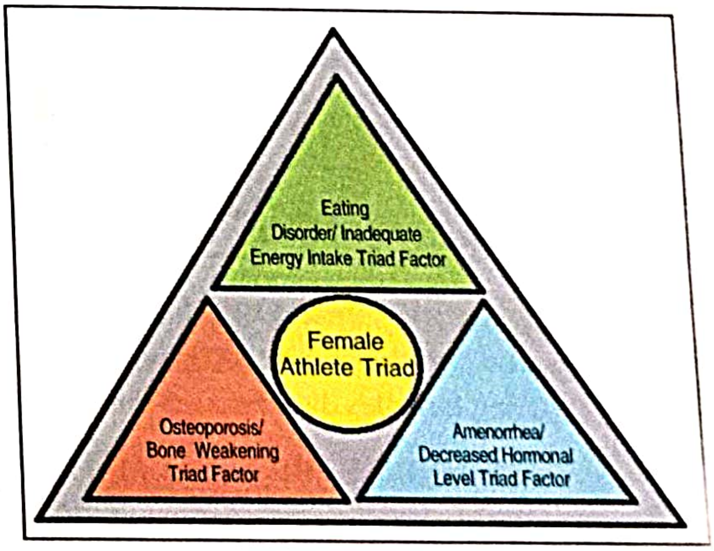
Menstrual Dysfunction is an abnormal or irregular condition in women's menstrual cycle i.e., absence of menstrual bleeding. The amount of bleeding varies; some have less bleeding whereas some women have heavy and prolonged bleeding. Most of the menstrual cycle occurs after every 22 to 35 days.

Pre-menstrual Syndrome : During Menstrual Dysfunction, most of the women complain about breast pain, back pain, headache, fatigue, tiredness, cramps, constipation, depression etc. Due to blood flow the iron in blood reduces thus chances of Anemia increases.

Activities During Menstrual Dysfunction : The treatment for severe uterine bleeding may include hormonal therapy, taking more iron food i.e., green leafy vegetables. During these days women should be more careful about their cleanliness, hygienic habits, personal cleanliness, etc. Menstrual dysfunction is the normal physiological phase in female. The research has proved that female can participate in light to moderate physical activity without any complication, whereas heavy training schedule of physical activity can be participated with care of personal cleanliness and hygienic habits. If complications arise during menstrual dysfunction due to physical activity female should consult gynecologist or doctor.

5. FEMALE ATHLETE TRIAD (OSTEOPOROSIS, AMENORRHEA, EATING DISORDERS)

Participation in sports and physical activities provides a lot of physical and social benefits like developing leadership qualities, competition, team work etc. However, participation in sports is not without certain health risks. Sports like Judo, boxing, wrestling, taekwondo etc. exert a lot of pressure on athletes to maintain their shape and weight. Such pressures put the athlete's health at risk and leads to Female Athlete Triad.


Eating Disorder/ Inadequate Energy Intake Triad Factor
Female Athlete Triad
Osteoporosis/ Bone Weakening Triad Factor
Amenorrhea/ Decreased Hormonal Level Triad Factor

Female Athlete Triad is the condition which is seen in females, participating in extreme hard work during sports activities or to reduce body weight under intense pressure of diet. The triad is a serious illness with lifelong health consequences and can be fatal. It is the syndrome of female in which Osteoporosis, Amenorrhea and Eating disorder are present and also known as Triad. This condition is most common in cross-country runners, gymnasts, judo, boxing, wrestling, taekwondo etc. The competitive sports that promote this physical leanness may result in disordered eating and responsible for the origin of Female Athlete Triad.

Sports and exercise are part of a balanced, healthy lifestyle. People who play sports are healthier; get better grades, are less likely to experience depression, etc.

Girls who are not balancing the needs of their bodies and their sports can have major consequences. Girls who play sports or do exercises intensively are at risk for a problem called Female Athlete Triad which is a combination of three conditions: Osteoporosis, Amenorrhea, Disordered eating. The Female Athlete Triad is a syndrome of three inter-related conditions. Thus, if an athlete is suffering from one element of triad, it is likely that she is suffering from the other two components of triad as well.

(I) OSTEOPOROSIS

It is also known as Bone Weakening Triad Factor. Osteoporosis is the weakening of bones due to the loss of bone density and improper bone formation. This condition declines the performance and leads to bone injuries. Estrogen gets lower in girls with Female Athlete Triad. The low level of estrogen and poor nutritional diet (especially low calcium) lead to osteoporosis.

(II) AMENORRHEA

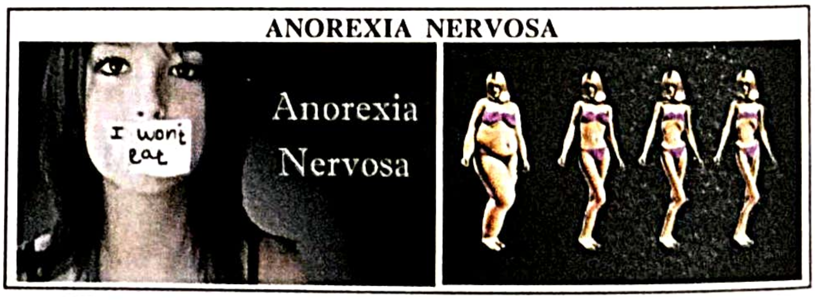
It is also known as Decreased Hormonal Level Triad Factor. In this Second Triad factor (Amenorrhea), female faces varied menstrual cycle due to varied hormonal level. The cause of this disorder is due to less energy level; reduced vitamin and mineral diet and over physical training by female. In this the cessation of menstrual cycle is for more than three months.

(III) EATING DISORDER

It is also known as Inadequate Energy Intake Triad Factor. Most girls with Female Athlete Triad try to lose weight as a way to improve their athletic performance. In this Triad Factor (Disordered Eating), the females do not eat enough calories and thus their energy level reduces which causes many health problems. It is of two types – Bulimia or Anorexia Nervosa.

(A) BULIMIA NERVOSA: **Bulimia Nervosa is a eating disorder characterised by binge eating followed by compensatory behaviour such as purging (self-induced vomiting, excessive use of laxatives or diuretics or excessive exercise).** In this disorder of eating, the person consumes large amount of food rapidly, followed by binging and purging. This disorder leads to loss of important minerals from body thus leading to serious health problems like Anemia. It also causes low self-esteem, depression and mental health problems.

BULIMIA NERVOSA


ANOREXIA NERVOSA

(B) ANOREXIA NERVOSA: **Anorexia Nervosa eating disorder is characterised by food restriction and irrational fear of gaining weight as well as a distorted body self-perception.** The persons suffering from this disorder keep thinking about reducing weight, thus their life become stressful.

CAUSES, SYMPTOMS AND TREATMENT OF FEMALE ATHLETE TRIAD

Causes of Female Athlete Triad : Insufficient Calcium Diet, Amenorrhea; Eating disorders; Poor nutrition; Sedentary life style; Thyroid condition; Lack of vitamin D; Hormonal imbalance; Over training; Less liquid diet, etc.

Symptoms of Female Athlete Triad : Disordered eating, fatigue, hair loss, dry skin, weight loss, increased healing time for injuries, increased injuries, cessation or irregular menstrual cycle, anemia, sensitivity to cold, low heart rate and blood pressure.

Treatment of Female Athlete Triad : The treatment of Female Athlete Triad consists of immediate consultation with Doctor or Gynecologist, taking nutritional and balanced diet, reducing exercise, counselling, taking food supplement for vitamins and minerals, behaviour therapy, etc.

Some Important Questions

Multiple Choice Questions (MCQs)

1. The main cause of Kyphosis is :

(*a*) Wrong sitting posture (*b*) Wrong foot wear

(*c*) Wrong sleeping posture (*d*) Wrong walking style.

2. Lordosis can be corrected through

(*a*) Backward bending exercises (*b*) Forward bending exercises

(*c*) Pillow walking (*d*) Sideward bending exercises.

3. Genu Valgum can be corrected :

(*a*) Backward Bending Exercises (*b*) Variksh Asana

(*c*) Forward Bending (*d*) Sideward bending.

4. In Bow-Legs deformity, there is : ***(Delhi 2020)***

(*a*) Wide gap between knees (b) Knees collide with each other

(*c*) Plain foot sole (*d*) Bending to sideward.

5. Menarche starts at :

(*a*) 8 to 10 years (*b*) 10 to 15 years (*c*) 17 to 19 years (*d*) 20 onward.

6. Which of the following is not a factor affecting motor development in children ? ***(Delhi 2020)***

(*a*) Parent or Hereditary(*b*) Nutritious food (*c*) Peer Group (*d*) Regular Practice.

7. Which of the following activity in children is good for development in Early Childhood ?

(*a*) Football (*b*) Athletics (*c*) Fun games (*d*) Volleyball.

8. Later childhood stage is between :

(*a*) 1 to 2 years (*b*) 2 to 6 years (*c*) 7 to 15 years (*d*) 13 to 19 years.

9. Female Athlete Triad has :

(*a*) Amenorrhea (*b*) Eating Disorder (*c*) Osteoporosis (*d*) All of these.

10. Women with Menstrual Dysfunction should participate in :

(*a*) Light and moderate physical activity (*b*) Heavy and stressful physical activity

(*c*) all type of physical activities (*d*) Normal activity.

11. Abnormal curve of spine at front is called .... ***(Delhi 2020)***

(*a*) Scoliosis (*b*) Kyphosis (*c*) Lordosis (*d*) Knock-Knees.

12. Menarche is defined as the ....

(*a*) Ending of menstrual period in women (*b*) Begining of menstrual cycle in girls

(*c*) Time period of pregnancy (*d*) Period of adolescent.

UNIT 3

YOGA AS PREVENTIVE MEASURE FOR LIFESTYLE DISEASES

TOPICS & LEARNING OUTCOMES

1. **Obesity : Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Pavanmuktasana, Matsyasana, Halasana, Paschimottanasana, Ardha - Matsyendrasana, Dhanurasana, Ushtrasana, Suryabedhan pranayama.**
2 **Diabetes : Procedure, Benefits & Contraindications for Katichakrasana, Pavanmuktasana, Bhujangasana, Shalabhasana, Dhanurasana, Supta-vajarasana, Paschimottanasana, Ardha-Matsyendrasana, Mandukasana, Gomukhasana, Yogmudra, Ushtrasana, Kapalbhati.**
3 **Asthma : Procedure, Benefits & Contraindications for Tadasana, Urdhwahastottanasana, UttanMandukasana, Bhujangasana, Dhanurasana, Ushtrasana, Vakrasana, Kapalbhati, Gomukhasana, Matsyasana, Anuloma-Viloma.**
4. **Hypertension : Procedure, Benefits & Contraindications for Tadasana, Katichakrasana, Uttanpadasana, Ardha-Halasana, Sarala Matsayasana, Gomukhasana, UttanMandukasana, Vakrasana, Bhujangasana, Makarasana, Shavasana, Nadi-shodhana pranayam, Sitli pranayam.**
5. **Back Pain and Arthritis : Procedure, Benefits and Contraindications for Tadasana, Urdhwahastottanasana, Ardha-Chakrasana, Ushtrasana, Vakrasana, Sarala Matsyendrasana, Bhujangasana, Gomukhasana, Bhadrasana, Makarasana, Nadi-Shodhana Pranayama.**

INTRODUCTION

Today man is not living in happy state of mind. Most of the people are very busy in their routine life. Thi stressful and poor environmental conditions in life has caused many health problems like obesity, diabetes, asthma back-pain, hypertension etc. Through lifestyle changes we can prevent, cure and reduce these health problems Yoga plays an important role to overcome these problems. Moreover, yoga helps to develop optimum level of health to lead happy and prosperous life.

International Day of Yoga
21 June

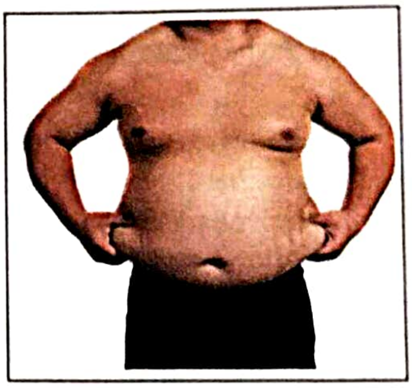
Yoga for Harmony & Peac

The origin of the word 'Yoga' is from Sanskrit word 'Yuj' which means 'to join'. **According to Patanjali (who is supposed to be the founder of yoga), the meaning of the word 'Yuj' is to stabilize the mind for the union of Atma (soul) and Parmatma (super controller).** In simple words, yoga is a way to join God, *i.e.*, merger of soul with God and experience of oneness with him. Practically speaking, yoga is a life science which deals with the health of body and harmony of mind. The main purpose of yoga is to provide sound body with tension-free and sound mind.

Asana is third step of yoga (after Yama and Niyam). Asanas are slow stretching activity in which holding a body posture brings stability of body and poise to mind. Yoga (Asana) is a 'science' as well as an 'art of living' for a healthy, happy and prosperous life; thus its effects are mostly internal. The effects of Asanas are internal felt and not observable. It also cures various diseases and chronic health problems, thus it has therapeutic effects. Regular practice of yoga develops and purifies body and mind to its optimal level. It develops proper functioning of glands in a balanced form. It develops ability to control our sense organs to function properly. It helps to relieve our stress and tensions to lead a peaceful life. It improves physical fitness, wellness along with good health to great extent.

Asanas are slow stretching activities in which heart rate, breathing rate, metabolism rate and body temperature remain normal. Asanas should be performed in duration of 30 seconds to 2 minutes hold of position, whereas several repetitions can be done. The breath should be controlled while performing asana. It should not be performed immediately after meal (except Vajra asana or Sukh asana). The effects are as under :

1. OBESITY



Obesity is the excess accumulation of fats resulting in increased body weight. In this problem, the excess fats of body get deposited under the skin, especially in areas like abdomen, chest, shoulder, buttocks and legs.

Symptoms : Obesity leads to many health problems like loss of physical efficiency; decline in physical personality (appearance); feeling tiredness while performing physical activity; cardiac problems etc. According to WHO the criteria for Obesity as per Body Mass Index(BMI) the score is 30 above.

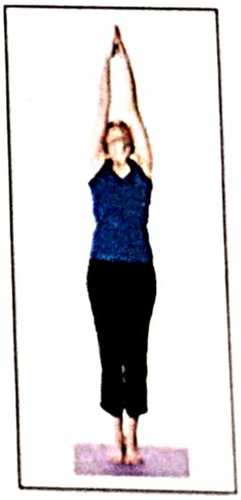
Category	Men	Women
Underweight Range	Less than 20	Less than 19
Healthy Range	20 to 25	19 to 24
Overweight Range	26 to 30	25 to 30
Obese Range	More than 30	More than 30

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Causes : The causes of obesity are genetically or hereditary; wrong dietary habits; less physical activity; overeating or eating a lot of fried things; drinking alcohol; sedentary lifestyle; hormonal variation like; hyper thyroids, imbalance of physical, mental and emotional energies etc.

CURING ASANAS, THEIR PROCEDURE, BENEFITS AND CONTRAINDICATIONS

TADASANA



Procedure : It is also named as Palm Tree pose. In this asana, person stands on toes, slowly raises both hands as much as possible while coming on toes. Arms by side of ears are raised over the head whereas hands holding each other at top. Maintain balance along-with deep breathing. Its advanced form is Vriksh-asana.

Benefits :

(*i*) Cures Hypertension, Obesity and Back pain.

(*ii*) Develops whole body muscles.

(*iii*) Increases height in children.

(*iv*) Relieves leg and ankle pain.

(*v*) Corrects Postural deformities like Kyphosis, Scoliosis, Neck Spondylitis and Flat-foot.

Contraindication : Person having severe Back-pain, Ankle problem should not do this.

KATICHAKRASANA

Procedure : In this asana, person stands on toes while arms are raised to side at shoulder level. Slowly twist trunk (abdomen) along with arms rolled over body. At the same time look back. Maintain balance along-with deep breathing. The preparatory asana is Tadasana.

Benefits :

(*i*) Cures Obesity, Diabetes, and Hypertension.

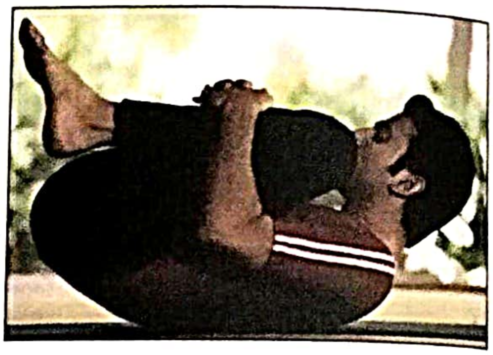
(*ii*) Tones up whole body muscles.

(*iii*) Cures digestive problems.

(*iv*) Corrects Postural deformities like Kyphosis, Scoliosis, and Neck Spondylitis.

Contraindication : Person having severe Back-pain, Spinal Disc problem, Abdomen ulcers and Pregnant women should not do this.

PAVANMUKTASANA



Procedure : It is also named as Air Release pose. It releases waste gases from abdomen (stomach and intestine). In this asana, lie down on your back with your feet together and arms beside your body. Bring your knees towards your chest and press the thigh on your abdomen with clasped hands. Lift your head and chest off the floor and touch your chin to your knees. Deep and long breathing is done. The relaxing asana after this is Matsayasana or Shav-asana.

Benefits :

(*i*) Prevents and cures Diabetes, Obesity, Back-pain and Hypertension.

(*ii*) Improves digestive functioning and reduces digestive and constipation problems.

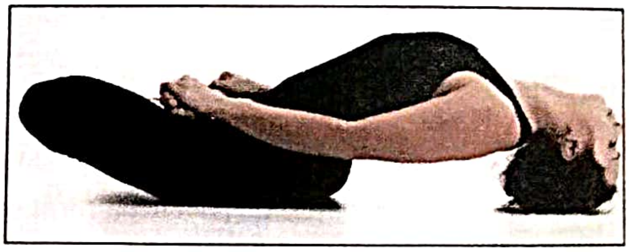
(*iii*) Cures and corrects the Postural problems like Back-pain, Neck Spondylitis.

(*iv*) Relieves in Menstrual Disorder.

(*v*) Relaxes mind.

Contraindication : Person suffering with asthma, advanced Spondylitis, Low Blood-Pressure and Migraine should not do this.

MATSAYASANA



Procedure : This asana is known as fish pose. From the Vajrasana, bend backward and lie on your back. Your feet are together and hands relaxed alongside the body. Keeping the chest elevated, lower the head backward and touch the top of the head to the floor. Lift your chest up from in-between the shoulder blades. Press the thighs and legs to the floor. Preparatory asana is Suptamatsayasana. The relaxing asana is Shav-asana. Advanced asana is Settu bandh-asana.

Benefits :

(*i*) Cures Asthma, Back-pain and Obesity.

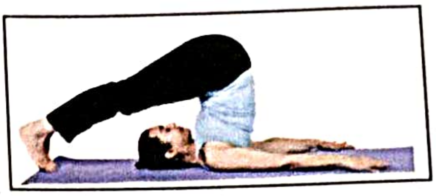
(*ii*) Strengthens leg, abdomen, shoulder and neck muscles.

(*iii*) Improves spine flexibility.

(*iv*) Cures gastric, indigestion and constipation problems.

Contraindication : Person suffering from Heart problems, Hypertension (High Blood-Pressure), Ulcers, Hernia, Sciatica and eye surgery should avoid this.

HALASANA



Procedure : **It is also named as Plow pose.** In this asana, the person lie down in supine lying position. The legs are slowly raises upward and backward over the head while breathing out. Hands remain at the same position on the floor towards the opposite side while supine is lifted. Body weight is shifted over neck and shoulders. The preparatory asana is Sarvang asana.

Benefits :

(*i*) Cures Obesity, Diabetes, and Hypertension.

(*ii*) Tones up whole body muscles.

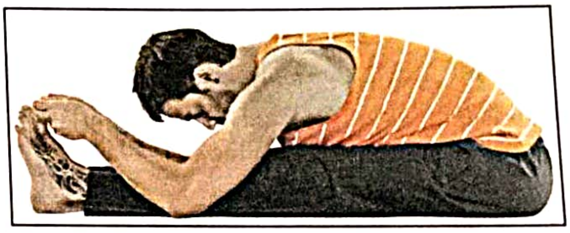
(*iii*) Cures digestive problems.

(*iv*) Improves the flexibility of Spine, Shoulder and back muscles.

(*v*) Corrects Postural deformities like Lordosis,

Contraindication : Person having severe Neck Spondylitis, Shoulder problem and Pregnant women should not do this.

PASCHIMOTTANASANA



Procedure : **The other name is West Salute Pose or forward bending in sitting.** In this asana, sit up with legs stretched out straight in front of you on the floor. Keep the spine erect and toes flexed towards you. Touch the thumb of the feet with your hands, slowly breathe out and try to place the head on the knees. Then slowly raise the head and come back to initial position. The preparatory asana are Bal-asana or Janusirsasana or Adhomukhavirasana.

Benefits :

(*i*) Prevents and cures Diabetic and Asthma patient.

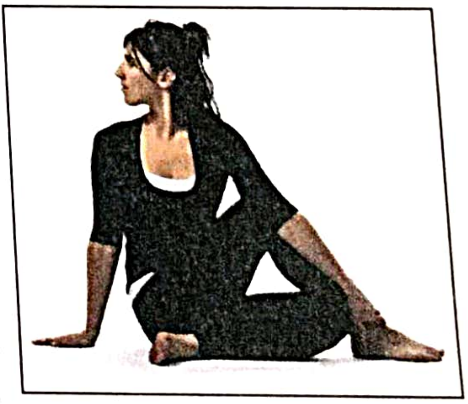
(*ii*) Controls weight and prevents obesity.

(*iii*) Back and leg muscles get strengthened and relaxed.

(*iv*) Cures gastric, indigestion and constipation problems.

Contraindication : Person suffering from Slip disc, Hernia, Enlarged liver, Spondylitis, Intestine ulcers and pregnant women should not do this.

ARDHA-MATSYENDRASANA



Procedure : **It is also named as Half Spinal Twist Pose.** Ardha-matsyendrasana is derived from Sanskrit words, where **ardha means *half*, matsya means *fish* thus also named as half fish pose. It is king of all asanas.** In this we sit in crossed leg, one leg is placed over the other so that the foot touches the opposite hip joint. The opposite hand (of raised leg) presses the leg inward whereas other hand supports the spine while looking back. The spine is twisted at same time erect. The preparatory asana is Bhardvasana whereas the advanced form is full Ardha-matsyendrasana.

Benefits :

(*i*) Prevents and cures Obesity and Diabetes.

(*ii*) Back and abdominal muscles are strengthened and toned up.

(*iii*) Increases the glandular functioning.

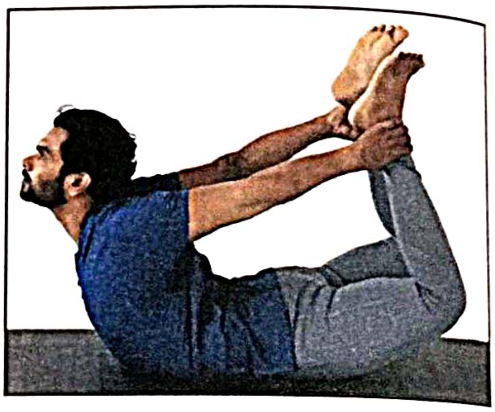
(*iv*) Shapes the body and improves the spinal flexibility.

(*v*) Cures postural deformities like Arthritis, Kyphosis, Lordosis, Scoliosis and Bow-legs.

Contraindication : Person with severe Back-pain, Disc problem, Hernia, Piles, severe Abdominal problem and Pregnant women should not do this.

DHANURASANA

Procedure : This asana is also named as Stretched Bow. In this the person lies down in pro-lying position. From this position the upper and lower body is raised up with the support of hands whereas hands hold the ankles.The whole body balances on the abdomen.



Benefits :

(*i*) Cures Obesity, Diabetes and Asthma .

(*ii*) Tones up whole body muscles.

(*iii*) Cures digestive problems.

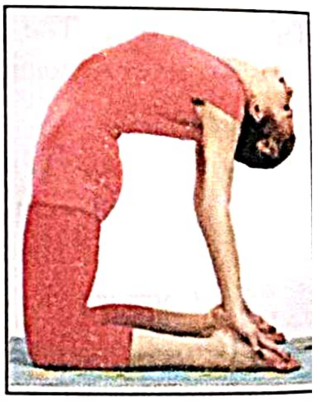
(*iv*) Relieves leg and ankle pain.

(*v*) Corrects Postural deformities like Kyphosis, Scoliosis .

Contraindication : Person having severe Neck Spondylitis, Shoulder problem and Pregnant women should not do this.

USHTRASANA

Procedure : It is also named as Camel Back pose. In this asana, the person sits in Vajrasana and holds the ankles by hands. Person starts raising the upper body (chest) the shoulders are raised up and back. Head is bent back while looking back. The preparatory asana is Vajrasana.



Benefits :

(*i*) Cures Obesity, Diabetes and Asthma .

(*ii*) Tones up whole body muscles.

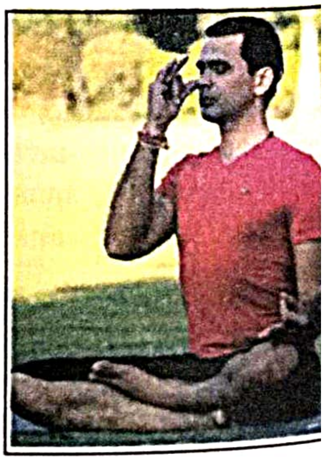
(*iii*) Improves digestive and respiratory system.

(*iv*) Corrects Postural deformities like Kyphosis, Scoliosis.

Contraindication : Person having severe Neck Spondylitis, Shoulder problem and Pregnant women should not do this.

SURYABHEDAN PRANAYAM

Procedure : The meaning of 'Surya' is Sun and the meaning of the word 'Bhedana' is piercing, enter or breaking through something. In this Pranayam we sit in Sukh asana, eyes are closed and deep breathing is done using right nostril for inhalation and the left one fo exhalation. The right hand's thumb and ring finger helps in this process while body is relaxed. The ches expands during Inhale and relaxes during Exhale. The same procedure is repeated again and again. According to Patanjali , the right nostril is considered as 'Surya Nadi' whereas left nostril is considered as 'Chandra Nadi' Thus, controlling the breaths from nostrils help to control and regulates the body temperature, digestion, other processes and also body organs.



Benefits :

(*i*) Cures Obesity, Diabetes, Asthma and Hypertension .

(*ii*) Improves the working of Stomach, Liver, Pancreas, Lungs etc.

(*iii*) Cures digestive problems, Cold, Cough etc.

(*iv*) Regulates body temperature and relieves from Stress and Headache.

Contraindication : Pregnant women should not do it stressfully.

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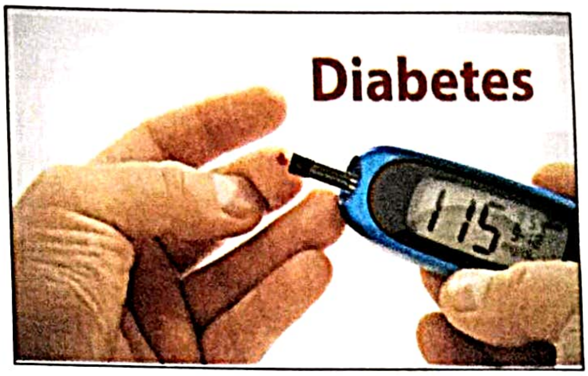
2. DIABETES



Diabetes is a disorder in which sugar (glucose) level increases in blood instead being used for energy production. In other words, Diabetes is a condition in which pancreas fails to produce insulin. Insufficient secretion of insulin by pancreas results in excess of glucose level in blood stream, resulting diabetes. Incidentally insulin is the hormone that converts the sugar (glucose) level in food into energy. If level of glucose is high, it eventually affects the important organs of body. It can be checked by Glucometer; when it shows reading above 150 (after normal meal) is considered dangerous.

Symptoms : Symptoms of Diabetes are like fatigue, hazy vision, excessive thirst (Polydipsia), excessive urination (Polyuria), weight loss, increased appetite (Polyphagia), prolonged healing time of injury, foul smelling of urine etc.

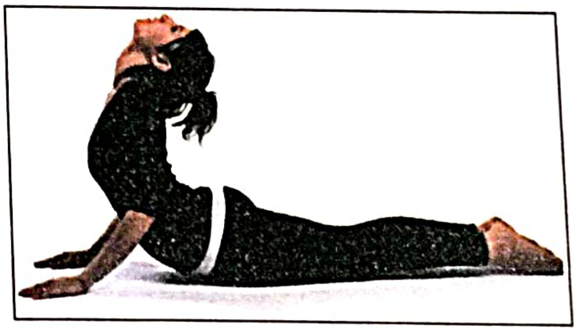
Causes : The main causes of diabetes are genetically or hereditary; overweight or obesity; Kidney disease; gastro-intestinal problems; drinking a lot of cold drinks or soda water; sedentary lifestyle; smoking and alcohol; less physical activity; taking lot of sweets, etc.

CURING ASANAS, THEIR PROCEDURE, BENEFITS AND CONTRAINDICATIONS

KATICHAKRASANA : Same as in Obesity (Pg no. 72)

PAVANMUKTASANA : Same as in Obesity (Pg no. 72)

BHUJANGASANA



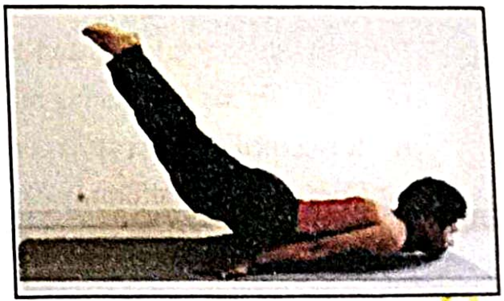
Procedure : It is also named as Cobra pose. From pro-lying position start raising the upper part of the body without the support of your hands while looking up. The preparatory asana is standing backward bending, The advanced form is Shalabh-asana, Dhanur-asana. It is relaxed by Utthita Bal-asana or Vajra-asana, KapalBhati etc.

Benefits :

(*i*) Prevents and cures Diabetes, Asthma and Obesity.
(*ii*) Improves digestive functioning.
(*iii*) Relieves the Cold & Bronchial Gastro and Constipation problems.
(*iv*) Cures and corrects Postural deformities like Kyphosis, Neck Spondylitis.
(*iv*) Strengthens hand and abdomen muscles.

Contraindication : Person suffering with Hernia, abdomen surgeries patient, pregnant women and severe Back injuries patient should not do this.

SHALABHASANA



Procedure : It is also named as Locust pose. From pro-lying position start raising the lower part of your body, hands should be by the side of the legs and chin touching the floor, while breathing is normal after attaining the pose.

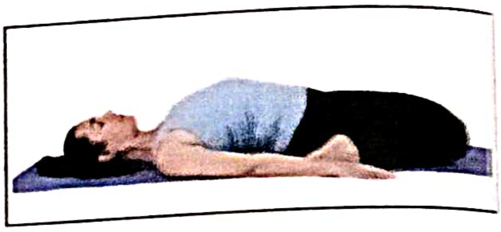
Benefits :

(*i*) Cures Diabetes and Asthma.
(*ii*) Tones up leg and back muscles.
(*iii*) Improves the digestive and other internal organs.
(*iv*) Corrects Postural deformities like Kyphosis.

Contraindication : Person having severe Back-pain problem and Pregnant women should not do.

DHANUR ASANA : Same as in Obesity (Pg 74)

SUPTA VAJRASANA



Procedure : It is also named as Sleeping Rock or Reclined Thunderbolt pose. In this asana, we firstly sit with flexed legs in Vajra asana. Slowly body is bent backward with support of hands and head gradually touches the floor. The spine is curved and back is raised up whereas hands by side holding toe. Body is resting over the ankles, hold this position for some time with normal breathing. The preparatory asana is Vajra-asana. The suggested asana to relax is Dand-asana or Shav-asana.

Benefits :

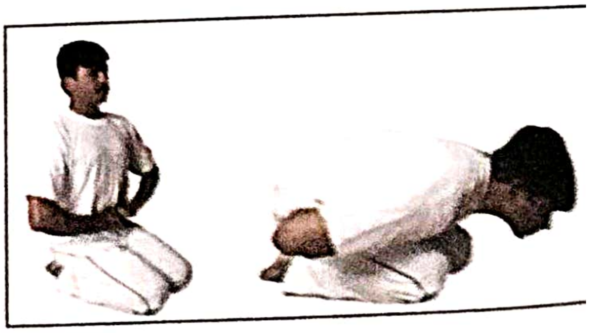
(*i*) Prevents and cures Diabetes, Asthma and Hypertension.
(*ii*) Improves leg muscles and shapens legs.
(*iii*) Improves the functioning of abdominal organs.
(*iv*) It is a meditative pose to perform various pranayams.
(*v*) Cures Postural deformity like Kyphosis, Flat-foot and Arthritis.
(*vi*) Relieves from mild Hernia and Piles.

Contraindication : Person suffering with chronic piles, back-pain, knee or ankle joint injury, injury overleg muscles like hamstring, quadriceps and calves muscles should avoid this.

PASCHIMOTTANASANA : Same as in Obesity (Pg 73)

ARDHA MATSYENDRASANA : Same as in Obesity (Pg 73)

MANDUKASANA



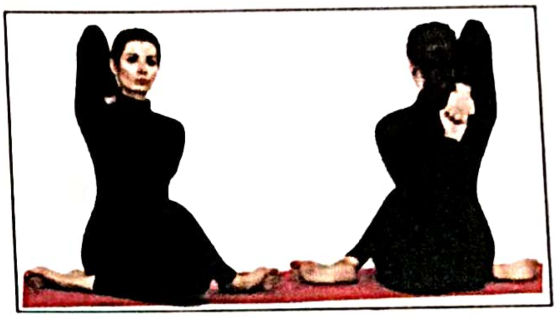
Procedure : In this asana, we firstly sit with flexed legs in Vajra asana. Hands are over abdomen with fist. Slowly bend forward while exhaling. Hold this position for some time and try to touch chin on the floor. Also, feel the pressure over the abdomen during breathing. The preparatory asana is Vajra-asana.

Benefits :

(*i*) Prevents and cures Diabetes, Asthma, Obesity and Hypertension.
(*ii*) Improves leg muscles and shapens legs.
(*iii*) Improves the functioning of internal organ especially pancreas and liver.
(*iv*) It is a meditative pose to perform various pranayams.
(*v*) Cures Postural deformity like Lordosis, Flat-foot and Arthritis.
(*vi*) Relieves from mild Hernia, Stomach ache, Headache, etc

Contraindication : Person suffering with chronic piles, knee or ankle joint injury, injury over leg muscles like hamstring, quadriceps and calves muscles should avoid this.

GOMUKHASANA



Procedure : Gomukhasana gets its name from Cow face as this pose resembles the face of cow. The thighs and calves are placed in such a way that the knees overlap or tapering each other and widen at ankles. One arm is overhead and other is under the shoulder. The hands holds each other at back. Preparatory asana is Baddha-asana. The relaxing asana is Bharadvaj-asana.

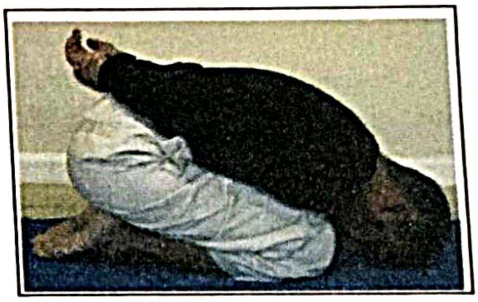
Benefits :

(*i*) Prevents and cures Asthma, Back-pain.

(*ii*) Develops the flexibility of shoulder, neck, legs and back muscles.

Contraindication : Person with severe shoulder dislocation problem, neck spondylitis, knee problem, sciatica and pregnant women should avoid this.

YOGMUDRA



Procedure : In this asana, we firstly sit with flexed legs in Vajra asana. Hands are placed at back *i.e.*, behind the spine. Slowly bend forward while exhaling. Hold this position for some time and try to touch forehead on the floor. Also, feel the pressure over the abdomen during breathing.

Benefits :

(*i*) Prevents and cures Diabetes, Obesity, Asthma and Hypertension.

(*ii*) Tones up and shapens leg muscles.

(*iii*) Improves the functioning of internal organ especially pancreas and liver.

(*iv*) It is a meditative pose to perform various pranayams.

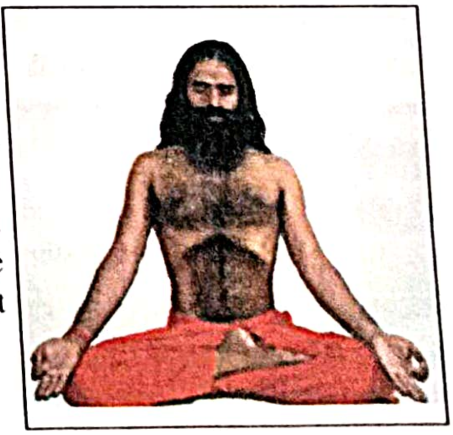
(*v*) Cures Postural deformity like Lordosis, Flat-foot and Arthritis.

(*vi*) Relieves from mild Hernia, Stomach ache, Headache, etc.

Contraindication : Person suffering with chronic piles, joint pain at knee or ankle, injury over leg muscles like hamstring, quadriceps, and calves muscles should avoid this.

USHTRASANA : Same as in Obesity (Pg no. 74)

KAPAL BHATI



Procedure : Sit in any meditative posture, close your eyes and relax the whole body. Inhale deeply through both nostrils, expand the chest. Expel the breath with forceful contractions of the abdominal muscles and relax. In other words in this pranayam, a long inhale is taken whereas forceful exhale is done from nose with pressure while stomach is vibrated in and out. Do not strain and continue active/forceful exhalation and passive inhalation.

Benefits :

(*i*) Prevents and cures Diabetes and Obesity.

(*ii*) Cures cold, cough and asthma.

(*iii*) Removes digestive problems and gives gentle massage to abdominal organs.

(*iv*) Improves the glandular functioning.

Contraindication : Person with abdomen surgeries and pregnant women should not do this. It should not be done immediately after meal.

3. ASTHMA

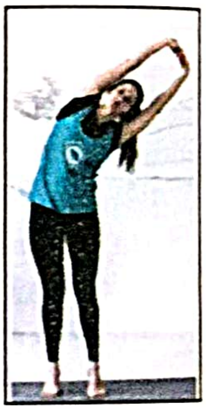
It is a disease of respiratory system. **Asthma is a chronic lung disease in which the lungs inflame or swollen or narrow the respiratory tract.** It often triggers when there is exposure to an allergens, cold air, exercise or emotional stress.

Symptoms : Symptoms include continuous coughing, difficulty in exhaling (Episodic Dyspnea), shortness of breath (Hypercapnia increased CO_2), chest tightness, wheezing and sometimes increased mucus production in wind pipe.

Causes : The prime cause of Asthma is pollution like by dust, pollen grains, air pollution, animal skin, hair, feathers etc.

CURING ASANAS, THEIR PROCEDURE, BENEFITS AND CONTRAINDICATIONS

URDHWA HASTOTTANASANA



Procedure : It is a hand stretched up posture. From standing position the arms are raised up by side of ears. Slowly body is bent to sideward without jerks while exhaling. Arms remains by side of head while looking forward whereas whole feet sole is on the surface along with balance. It is similar to Hasto asana.

Benefits :

(i) Prevents and cures Obesity, Diabetes, Asthma and Hypertension.

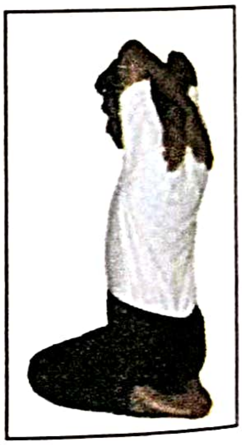
(ii) Improves and shapens leg and shoulder muscles along with balance.

(iii) Improves the functioning of internal organs especially the lungs.

(iv) Cures Postural deformities like Scoliosis, Bow legs.

Contraindication : Person suffering with Spinal Disc problem, Shoulder problem, Knee injury should avoid this.

UTTAN MANDUKASANA



Procedure : In this asana, we firstly sit with flexed legs in Vajrasana. Hands crossed at back over the shoulder and neck. Head should be pressed by the arms from back. Hold this position for some time and look front. Also, feel the pressure over the neck during breathing.

Benefits :

(i) Prevents and cures Asthma and Hypertension.

(ii) Tones up and shapens leg and shoulder muscles.

(iii) Improves the functioning of internal organs especially lungs.

(iv) Cures Postural deformities like Scoliosis, Flat-foot and Arthritis.

(v) Relieves from mild Hernia, Headache, Migraine.

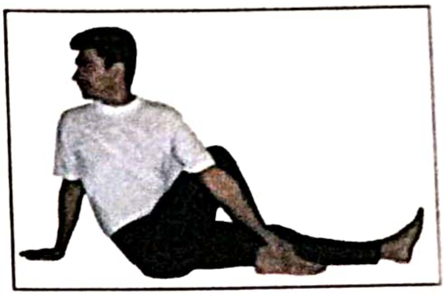
Contraindication : Person suffering with chronic piles, knee and ankle joint problem, injury over leg and shoulder muscles should not do this.

BHUJANGASANA : Same as in Diabetes (Pg no. 75)

DHANURASANA : Same as in Obesity (Pg no. 74)

USHTRASANA : Same as in Obesity (Pg no. 74)

VAKRASANA



Procedure : It is also named as Twisted pose. In this person sits with one leg is crossed and bent over the other leg. The opposite leg is kept straight. Hand opposite to bent leg is kept close to bent leg and it pushes the leg inward whereas other hand is at back and waist is also turned. Deep breathing is performed. Badhakon-asana provides relaxation after this. Its advanced form is Ardha matsyendrasana.

Benefits :

(*i*) Cures Obesity, Diabetes and Asthma.

(*ii*) Tones up whole body muscles.

(*iii*) Cures digestive problems and respiratory problems.

(*iv*) Corrects Postural deformities like Kyphosis, Scoliosis.

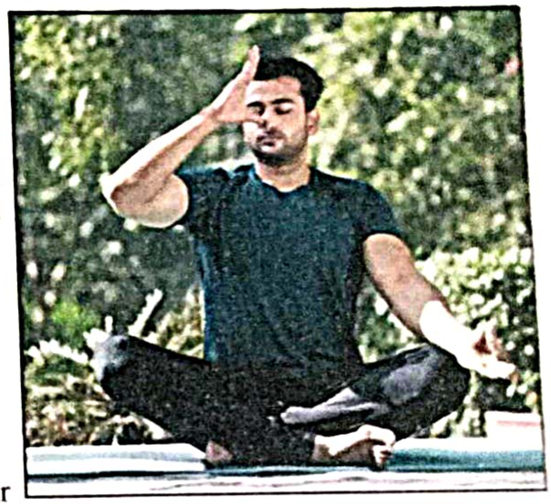
Contraindication : Person having severe Neck Spondylitis, Shoulder problem and Pregnant women should not do.

KAPAL BHATI : Same as in Diabetes (Pg no. 77)

GOMUKHASANA : Same as in Diabetes (Pg no. 77)

MATSAYASANA : Same as in Obesity (Pg no. 72)

ANULOM-VILOM



Procedure : It involves holding one nostril closed while inhaling, then holding the other nostril closed while exhaling. The process is then reversed and repeated. It's a form of alternate nostril breathing. In other word, it is a process of alternate nostril breathing. In this person do long inhalation from right nostril, hold it for some time and exhale from left nostril and vice-versa.

Benefits :

(*i*) Prevents and cures Asthma.

(*ii*) Cures cold & cough.

(*iii*) Relieves from stress, headache and anxiety.

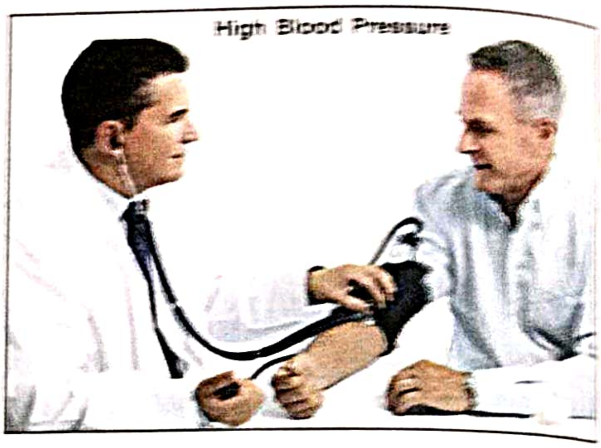
(*iv*) Regulates the body temperature and improve glandular functioning.

(*v*) Helps in meditation and improves concentration.

Contraindication : Person with severe Migraine problem, long hold of breath should avoid this.

4. HYPERTENSION

Hypertension is the condition in which the blood pressure in blood vessels remain higher and causes risk to important body organs. It is commonly known as High Blood Pressure. In the diagnosis, if the rate of blood pressure reaches above 140 (systolic) 90 (Disystolic) then hypertension is present. It is of various types such as Primary Hypertension due to no identification cause (Benign, Maligant), Secondary Hypertension due to disease (Cardio-vascular, Endocrine, Renal, Neurogenic, Pregnancy).



Symptoms : The symptoms of hypertension are dizziness, head heaviness, headache, chest palpitation, nose bleeding, shortness of breath, irritation and getting irritated easily, face turning red, visual problem, disturbed sleep (Insomnia), etc. Hypertension leads to serious health problems like heart failure, heart attack, coronary artery disease, other organs are also affected like kidney, liver, unchangeable aggressive attitude, paralysis etc.

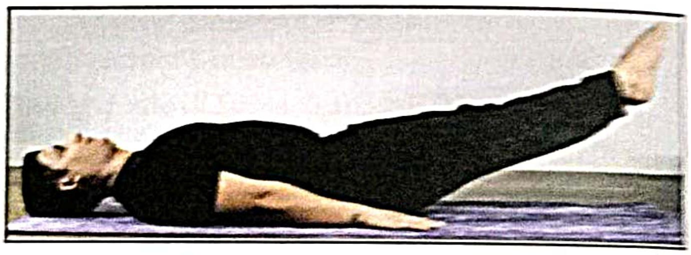
Causes : The causes of hypertension are hereditary, physiological, psychological and environmental like overweight (Obesity), high sodium salt usage, alcohol, lack of physical activity, smoking, stress, ageing, gastro problem etc.

CURING ASANAS, THEIR PROCEDURE, BENEFITS AND CONTRAINDICATIONS

TADASANA : Same as in Obesity (Pg 71)

KATICHAKRASANA : Same as in Obesity (Pg 72)

UTTANPADASANA



Procedure : It is also named as Raised Leg pose. From supine-lying position start raising the lower part (legs) about one feet, whereas hands remain by the side of the legs. Head and Spine should remain in contact with the floor while breathing should be normal after attaining the pose.

Benefits :

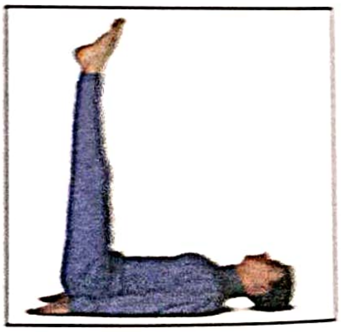
(*i*) Cures Hypertension and Asthma.

(*ii*) Strengthen and tones up leg, abdomen and back muscles.

(*iii*) Corrects Postural deformities like Lordosis.

Contraindication : Person having severe Back-pain problem and Pregnant women should not do this.

ARDHA-HALASANA



Procedure : It is also named as Half Plough pose. From supine-lying position start raising the lower part (legs) upto 90 degree, whereas hands remain by the side of the legs. Head and Spine should remain in contact with the floor while breathing should be normal after attaining the pose.

Benefits :

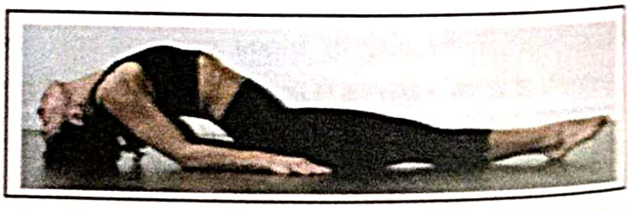
(*i*) Cures Hypertension and Asthma .

(*ii*) Strengthen and tones up leg, abdomen and back muscles.

(*iii*) Corrects Postural deformities like Lordosis.

Contraindication : Person having severe Back-pain problem and Pregnant women should not do this.

SARALA MATSAYASANA



Procedure : It is also named as Easy Fish pose. In this asana, we firstly lie down in supine-lying position whereas hands by side of legs. Slowly lift the spine and neck is raised with support of hands. The upper middle part of the body is raised *i.e.*, the spine is curved and back is raised up. The head and hips remain in the contact with the floor whereas hands by side of legs. Hold this position for some time with deep breathing.

Benefits :

(*i*) Prevents and cures Diabetes, Asthma and Hypertension.

(*ii*) Improves and shapens back and shoulder muscles.

(*iii*) Improves the functioning of abdominal organs especially lungs.

(*iv*) It is a meditative pose to perform various pranayams.

(*v*) Cures Postural deformities like Kyphosis, Neck Spondylitis.

Contraindication : Person suffering with chronic Back-pain, Shoulder joint injury should not do this.

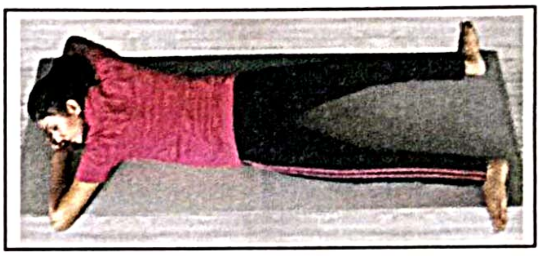
GOMUKH ASANA : Same as in Diabetes (Pg no. 77)

UTTAN MANDUKASANA : Same as in Asthma (Pg no. 78)

VAKRASANA : Same as in Asthma (Pg no. 79)

BHUJANGASANA : Same as in Diabetes (Pg no. 75)

MAKARASANA



Procedure : It is also named as Crocodile pose. In this asana, we lie down in pro-lying position whereas hands remain under the head. Neck is turned to side while feet apart comfortably. Hold this position for some time and relax with deep breathing.

Benefits :

(*i*) Prevents and cures Asthma and Hypertension.

(*ii*) Relaxes body completely and removes stress and tension.

(*iii*) It is a meditative pose to perform various pranayams.

(*iv*) Cures Postural deformities like Lordosis and Neck Spondylitis

Contraindication : Person suffering with chronic Back-pain, Shoulder joint injury should not do this.

SHAVASANA

Procedure : It is also named as Dead Pose. Lie flat on your back (Supine line position). Legs should be separated approximately one feet. Keep your arms at your side and your palms facing up. Start concentrating from your head to your feet. This means you are consciously relaxing your each part of the body. Don't move ahead without relaxing particular part of the body. On each inhaling and exhaling (breathing) assume that your body is totally relaxed. Let your tension, stress, depression and worry run away on each exhaling.

Benefits :

(*i*) Cures Hypertension.

(*ii*) Relaxes body and mind.

(*iii*) Stabilize breathing.

Contraindication : It may be the easiest pose to do, but it's the most difficult to master. Those with severe Back-pain, neck spondylitis should restrain. If the environment is cold, cover your body with a blanket. Keep the room dark or cover the eyes with an eye bag or bandage.

NADI-SHODHANA PRANAYAM

Procedure : It involves alternate breathing from both the nostrils *i.e.*, inhale from one side of nostril and exhale from other side of the nostril in alternate manner. This process is then reversed and repeated again and again without any stress. In this process the hand remains close to the nostril and support inhalation and exhalation using thumb and ring finger with alternate nostril breathing.

Benefits :

(*i*) Prevents and cures Asthma and Hypertension.

(*ii*) Cures cold cough.

(*iii*) Relieves from stress, headache and anxiety.

(*iv*) Regulates the body temperature and improves glandular functioning.

(*v*) Helps in meditation and improves concentration.

Contraindication : Person with severe Migraine problem and long hold of breath should avoid this.

SITLI PRANAYAM

Procedure : In this process, the inhalation is done from wet tongue. The tongue remains between lips making 'O' or circle shape. The exhalation is done from nostrils. Repeat this process again and again without any stress.

Benefits :

(*i*) Prevents and cures Asthma and Hypertension.

(*ii*) Cures cold & cough.

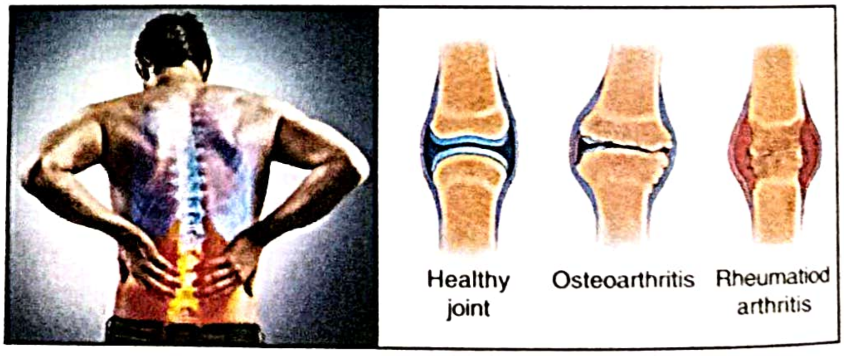
(*iii*) Relieves from stress, headache and anxiety.

(*iv*) Regulates the body temperature and improves glandular functioning.

(*v*) Helps in meditation and improves concentration.

Contraindication : Person with severe Migraine problem and long hold of breath should avoid this.

5. BACK PAIN AND ARTHRITIS



Back pain is the severe pain felt at the backaround spine. Usually muscles, bones, ligaments and joints aches continuously feel near the spine. It often paining at low back.

Arthritis is the swelling and tenderness of one or more joints. The main symptoms of arthritis are joint pain and stiffness, which typically worsen with age. The most common types of arthritis are osteoarthritis and rheumatoid arthritis

Symptoms : Symptoms may include dull or severe pain and sometime burning sensation, weakness, etc. Back-pain may have a sudden onset, can be chronic pain or can be constant. Backpain can be divided anatomically : Neck-pain (Neck Spondylitis), Middle Back-pain, Lower Back-pain or Tailbone-pain.

Causes : The increase in uric acid in blood, can cause gout in synovial fluid around the joint. Infections or underlying disease, such as psoriasis or lupus, can cause other types of arthritis. Osteoarthritis;

when the slippery tissue lining of the bones that covers the ends of bones gets damaged or break-down in which the immune system attacks the joints, beginning with the lining of joints.

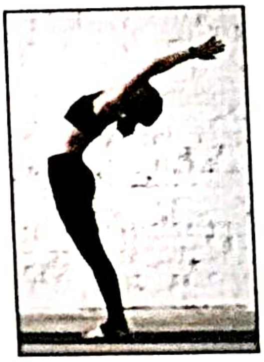
The causes of back pain are wrong posture during sitting, standing, sleeping, studying, injury, weak muscles, pregnancy, slipped disc due to jump or wrong action, jerky action without warm-up, sedentary lifestyle, spondylitis, trauma, cancer, fracture, inflammatory diseases etc.

CURING ASANAS, THEIR PROCEDURE, BENEFITS AND CONTRAINDICATIONS

TADASANA : Same as earlier in Obesity (Pg no. 71)

URDHWA HASTOTTAN ASANA : Same as earlier in Asthma (Pg no. 78)

ARDHA CHAKRASANA



It is Half Wheel Pose. From standing position start bending backward. Feet are together whereas hands can be at back or at waist. Neck and abdomen is bent backward while looking at back.

Benefits : (*i*) Cures Hypertension. (*ii*) Improves flexibility of spine. (*iii*) Cures abdominal Neck Spondylitis, Kyphosis, Bow-legs.

Contraindication : Those with serious hip or spinal problems should avoid this asana as well as those with high blood pressure and brain ailments.

USHTRASANA : Same as earlier in Obesity (Pg no. 74)

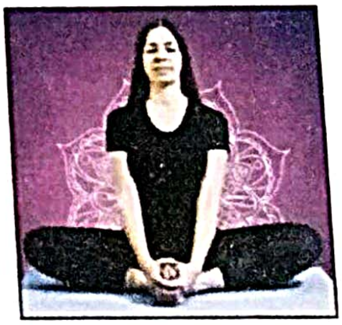
VAKRASANA : Same as earlier in Asthma (Pg no. 79)

SARALA MATSAYASANA : Same as earlier in Hypertension (Pg no. 80)

BHUJANGASANA : Same as earlier in Diabetes (Pg no. 75)

GOMUKHASANA : Same as earlier in Diabetes (Pg no. 77)

BHADRASANA

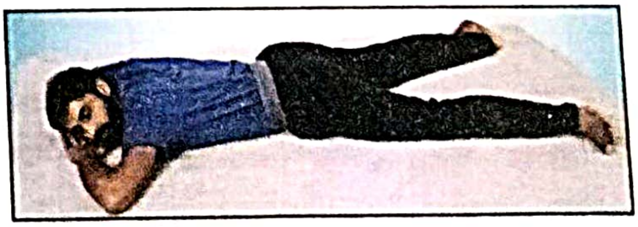


It is sitting with cross legged position while feet soles joined together and hands holding ankles. The spine is stretched up and hand relaxes over knees. Perform deep breathing or pranayams. Body becomes relaxed. Advance people can also sit in Siddh-asana or Padma-asana. This asana can be performed anytime even after the meal.

Benefits : (*i*) Cures Back pain, Arthritis and Asthma. (*ii*) It is a meditative posture to relive stress thus calms the body and mind. (*iii*) Strengthens the spine, knees and ankles muscles. (*iv*) Many pranayams can be performed in this posture.

Contraindication : Sitting more than 5 minutes; Person suffering with joint problems of knee or ankle; Sciatica problem, severe migraine problem should not do.

MAKARASANA



It is resting in pro-lying position in which hands are in front under the head.

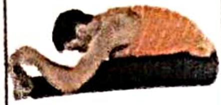
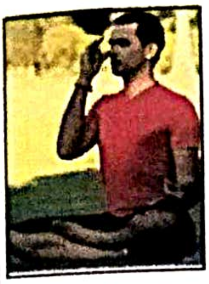
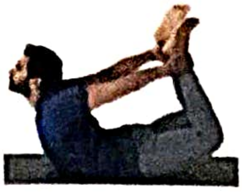
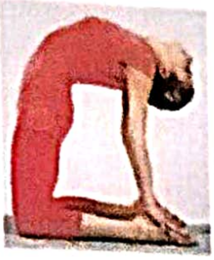
Benefits : (i) Cures Back pain and Arthritis (ii) Relaxes body. (iii) Improves breathing. (iv) Reduces stress and tensions. (v) Cures Lordosis.

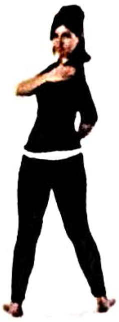
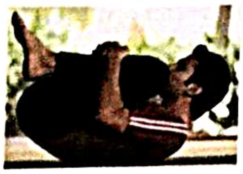
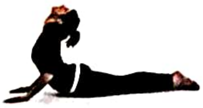
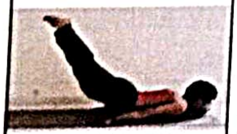
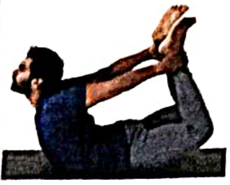
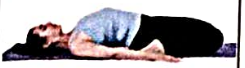
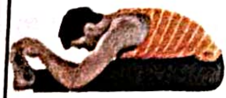
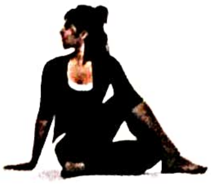
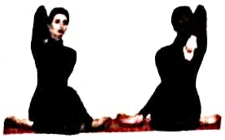
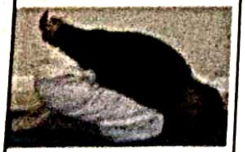
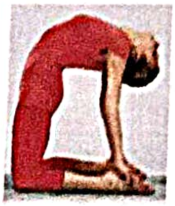
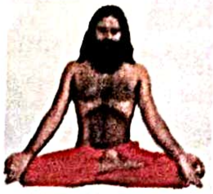
Contraindication : Sitting more than 5 minutes; Pregnant women and person suffering with severe migraine problem should not do.

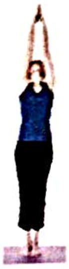
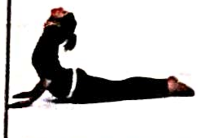
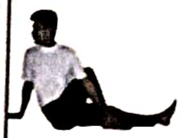
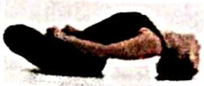
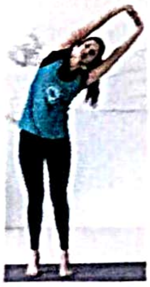
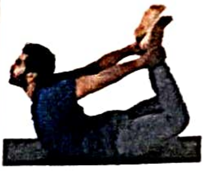
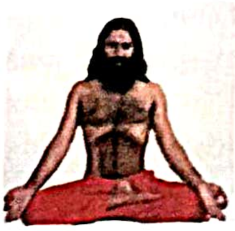
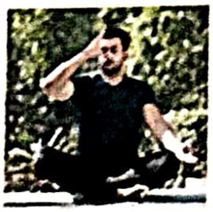
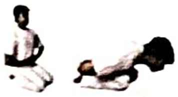
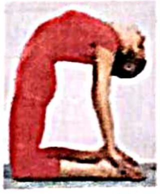
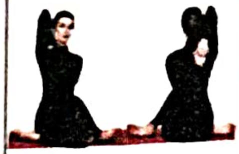
NADI SHODHANA PRANAYAM : Same as earlier in Hypertension (Pg no. 82)

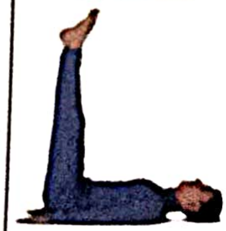
VARIOUS DISEASES, THEIR SYMPTOMS, CAUSES AND CURING ASANAS

Health Problem	Symptoms	Causes	Cured by Asana or Pranayam
Obesity : In this problem, the excess fats of body get deposited under the skin, especially in areas like abdomen, chest, shoulder, buttocks and legs. Tadasana Matsayasana	Obesity leads to many health problems like loss of physical efficiency; decline in physical personality; feeling tiredness while performing physical activity; cardiac problems etc. Body Mass Index (BMI) the score is 30 above. Katichakrasana Halasana	Genetically or hereditary; wrong dietary habits; less physical activity; over-eating or eating a lot of fried things; drinking alcohol; sedentary lifestyle; hormonal variation like; hyper thyroids, imbalance of physical, mental and emotional energies etc. Pavanmuktasana Ardha-matsyendrasana	**Tadasana: It is also named as Palm Tree pose.** In this asana, person stands on toes, slowly raises both hands as much as possible while coming on toes. Arms by side of ears are raised over the head whereas hands holding each other at top. Maintain balance along-with deep breathing. **Katichakrasana:** In this asana, person stands on toes while arms are raised to side at shoulder level. Slowly twist trunk (abdomen) along with arms rolled over body. At the same time look back. Maintain balance along-with deep breathing. **Pavanmuktasana : It is also named as Air Release pose.** It releases waste gases from abdomen (stomach and intestine). In this asana, lie down on your back with your feet together and arms beside your body. Bring your knees towards your chest and press the thigh on your abdomen with clasped hands. Lift your head and chest off the floor and touch your chin to your knees. Deep and long breathing is done. **Matsayasana** : This asana is known as fish pose. From the Vajrasana, bend backward and lie on your back. Your feet are together and hands relaxed alongside the body. Keeping the chest elevated, lower the head backward and touch the top of the head to the floor. Lift your chest up from in-between the shoulder blades. Press the thighs and legs to the floor. **Halasana: It is also named as Plow pose.** In this asana, the person lie down in supine lying position. The legs are slowly raises upward and backward over the head while breathing out. Hands remain at the same position on the floor towards the opposite side while supine is lifted. Body weight is shifted over neck and shoulders. The preparatory asana is Sarvang asana. **Ardha-Matsyendrasana : It is also named as Half Spinal Twist Pose.** Ardha-matsyendrasana is derived from Sanskrit words, where **ardha means *half*, matsya means *fish* thus also named as half fish pose. It is king of all asanas.** In this we sit in crossed leg, one leg is placed over the other so that the foot touches the opposite hip joint. The opposite hand (of raised leg) presses the leg inward whereas other

 Paschimottanasana  Suryabhedan Pranayam	 Dhanurasana	 Ushtrasana	hand supports the spine while looking back. The spine is twisted at same time erect. **Paschimottan Asana** : The other name is West Salute Pose or forward bending in sitting. In this asana, sit up with legs stretched out straight in front of you on the floor. Keep the spine erect and toes flexed towards you. Touch the thumb of the feet with your hands, slowly breathe out and try to place the head on the knees. Then slowly raise the head and come back to initial position. The preparatory asana are Bal-asana or Janusirsasana or Adhomukhavirasana. **Dhanurasana** : **This asana is also named as Stretched Bow.** In this the person lies down in pro-lying position. From this position the upper and lower body is raised up with the support of hands whereas hands hold the ankles.The whole body balances on the abdomen. **Ushtrasana** : **It is also named as Camel Back pose.** In this asana, the person sits in Vajrasana and holds the ankles by hands. Person starts raising the upper body (chest) the shoulders are raised up and back. Head is bent back while looking back. The preparatory asana is Vajrasana. **Suryabhedan Pranayam** : The meaning of 'Surya' is Sun and the meaning of the word 'Bhedana' is piercing, enter or breaking through something. In this Pranayam we sit in Sukh asana, eyes are closed and deep breathing is done using right nostril for inhalation and the left one for exhalation. The right hand's thumb and ring finger helps in this process while body is relaxed. The chest expands during Inhale and relaxes during Exhale. The same procedure is repeated again and again.
Diabetes : It is a disorder in which sugar (glucose) level increases in blood instead being used for energy production. In this pancreas fails to produce	Fatigue, hazy vision, excessive thirst (Polydipsia), excessive urination (Polyuria), weight loss, increased appetite (Polyphagia), prolonged healing time of injury, foul smelling of urine	The main causes of diabetes are genetically or hereditary; overweight or obesity; Kidney disease; gastro intestinal problems; drinking a lot of	**Katichakrasana** : Same as earlier. **Pavanmuktasana:** Same as earlier. **Bhujangasana** : **It is also named as Cobra pose.** From pro-lying position start raising the upper part of the body without the support of your hands while looking up. The preparatory asana is standing backward bending. The advanced form is Shalabh-asana, Dhanur-asana. **Shalabhasana** : **It is also named as Locust pose.** From pro-lying position start raising the

sufficient insulin resulting excess of glucose level in blood stream. It affects the important organs of the body.	etc. It can be checked by Gluco-meter; when it shows reading above 150 (after normal meal) is considered dangerous.	cold drinks or soda water; sedentary lifestyle; smoking and alcohol; less physical activity; taking lot of sweets, etc.	lower part of your body, hands should be by the side of the legs and chin touching the floor, while breathing is normal after attaining the pose.
 Katichakrasana	 Pavanmuktasana	 Bhujangasana	**Dhanurasana:** Same as earlier. **Supta Vajrasana: It is also named as Sleeping Rock or Reclined Thunderbolt pose.** In this asana, we firstly sit with flexed legs in Vajrasana. Slowly body is bent backward with support of hands and head gradually touches the floor. The spine is curved and back is raised up whereas hands by side holding toe. Body is resting over the ankles, hold this position for some time with normal breathing. The preparatory asana is Vajrasana. **Paschimottan asana:** Same as earlier. **Ardha-matsyendrasana :** Same as earlier.
 Shalabhasana	 Dhanurasana	 Supta Vajrasana	**Mandukasana:** In this asana, we firstly sit with flexed legs in Vajrasana. Hands are over abdomen with fist. Slowly bend forward while exhaling. Hold this position for some time and try to touch chin on the floor. Also, feel the pressure over the abdomen during breathing. **Gomukhasana:** Gomukhasana gets its name from Cow face as this pose resembles the face of cow. The thighs and calves are placed in such a way that the knees overlap or tapering each other and widen at ankles. One arm is overhead and other is under the shoulder. The hands holds each other at back.
 Paschimottanasana	 Ardhamatsyendrasana	 Gomukhasana	**Yogmudra asana:** In this asana, we firstly sit with flexed legs in Vajrasana. Hands are placed at back *i.e.*, behind the spine. Slowly bend forward while exhaling. Hold this position for some time and try to touch forehead on the floor. Also, feel the pressure over the abdomen during breathing. **Ushtrasana:** Same as earlier.
 Yogmudra	 Ushtrasana	 Kapal Bhati	**Kapal Bhati:** Sit in any meditative posture, close your eyes and relax the whole body. Inhale deeply through both nostrils, expand the chest. Expel the breath with forceful contractions of the abdominal muscles and relax. In other words, in this pranayam, a long inhale is taken whereas forceful exhale is done from nose with pressure while stomach is vibrated in and out. Do not strain and continue active/forceful exhalation and passive inhalation.

Asthma : It is a disease of respiratory system. Asthma is a chronic lung disease in which the lungs inflames or swollen or narrows the respiratory tract in the lungs. It often triggers when there is exposure to an allergens, cold air, exercise or emotional stress.  Tadasana  Bhujangasana  Vakrasana  Matsayasana	Symptoms include continuous coughing, difficulty in exhaling (Episodic Dyspnea), shortness of breath (Hypercapnia increased CO_2), chest tightness, wheezing and sometimes increased mucus production in wind pipe.  Urdhwahastottan Asana  Dhanurasana  Kapal Bhati  Anulom-Vilom	The prime cause of Asthma is pollution like by dust, pollen grains, air pollution, animal skin, hair, feathers etc.  Uttan Mandukasana  Ushtrasana  Gomukhasana	**Tadasana:** Same as earlier. **Urdhwahastottan asana:** It is a hand stretched up posture. From standing position the arms are raised up by side of ears. Slowly body is bent to sideward without jerks while exhaling. Arms remains by side of head while looking forward whereas whole feet sole is on the surface along with balance. It is similar to Hasto asana. **Uttan Mandukasana:** In this asana, we firstly sit with flexed legs in Vajrasana. Hands crossed at back over the shoulder and neck. Head should be pressed by the arms from back. Hold this position for some time and look front. Also, feel the pressure over the neck during breathing. **Bhujangasana:** Same as earlier. **Dhanurasana:** Same as earlier. **Ushtrasana:** Same as earlier. **Vakrasana :** It is also named as Twisted pose. In this person sits with one leg is crossed and bent over the other leg. The opposite leg is kept straight. Hand opposite to bent leg is kept close to bent leg and it pushes the leg inward whereas other hand is at back and waist is also turned. Deep breathing is performed. **Kapal- bhati pranayam :**Same as earlier. **Gomukhasana:** Same as earlier. **Matsayasana:** Same as earlier. **Anulom-vilom pranayam:** It involves holding one nostril closed while inhaling, then holding the other nostril closed while exhaling. The process is then reversed and repeated. It's a form of alternate nostril breathing. In other word, it is a process of alternate nostril breathing. In this person do long inhalation from right nostril, hold it for some time and exhale from left nostril and vice-versa.

Hypertension (High Blood Pressure) : It happens when the pressure in blood vessels gets high enough leading to risk other body parts. Diagnosed by, if the rate of blood pressure reaches above 140/ 90. Tadasana  Ardha-Halasana Uttan-mandukasana Makarasana Sitli	The symptoms of hypertension are dizziness, head heaviness, headache, chest palpitation, nose bleeding, and shortness of breath, irritation and getting irritated easily, face turning red, visual problem, disturbed sleep (Insomnia), etc. Katichakrasana Sarala Matsayasana Vakrasana Shavasana	Primary cause due to no Benign, Maligant, Secondary cause Cardio-vascular, Endocrine, Renal, Neurogenic, Pregnancy. Like overweight (Obesity), high sodium salt usage, alcohol, lack of physical activity, smoking, stress, ageing hereditary (family history), gastro problem. Uttanpadasana Gomukhasana Bhujangasana Nadi-Shodhan	**Tadasana:** Same as earlier. **Katichakrasana:** Same as earlier. **Uttan-padasana: It is also named as Raised Leg pose.** From supine-lying position start raising the lower part (legs) about one feet, whereas hands remain by the side of the legs. Head and Spine should remain in contact with the floor while breathing should be normal after attaining the pose. **Ardha-halasana: It is also named as Half Plough pose.** From supine-lying position start raising the lower part (legs) upto 90 degree, whereas hands remain by the side of the legs. Head and Spine should remain in contact with the floor while breathing should be normal after attaining the pose. **Sarala Matsayasana: It is also named as Easy Fish pose.** In this asana, we firstly lie down in supine-lying position whereas hands by side of legs. Slowly lift the spine and neck is raised with support of hands. The upper middle part of the body is raised i.e., the spine is curved and back is raised up. The head and hips remain in the contact with the floor whereas hands by side of legs. Hold this position for some time with deep breathing. **Gomukhasana:** Same as earlier. **Uttan Mandukasana:** Same as earlier. **Vakrasana:** Same as earlier. **Bhujangasana:** Same as earlier. **Makarasana:** Same as earlier. **Shavasana:** Same as earlier. **Nadi-shodhan pranayam :** It involves alternate breathing from both the nostrils *i.e.*, inhale from one side of nostril and exhale from other side of the nostril in alternate manner. This process is then reversed and repeated again and again without any stress. In this process the hand remains close to the nostril and support inhalation and exhalation using thumb and ring finger with alternate nostril breathing. **Sitli pranayam :** In this process, the inhalation is done from wet tongue. The tongue remains between lips making 'O' or circle shape. The exhalation is done from nostrils. Repeat this process again and again without any stress.

Back Pain and Arthritis Back pain is severe pain felt at the back around spine. Usually muscles, bones, ligaments and joints aches continuously near the spine. It often paining at low back. Arthritis is the swelling and tenderness of one or more joints. The most common types of arthritis are osteoarthritis and rheumatoid arthritis. Tadasana Urdhwa Hastottan Asana	Symptoms may include dull or severe pain and sometime burning sensation, weakness, etc. Back-pain may have a sudden onset, can be chronic pain or can be constant. Backpain can be divided anatomically : Neck-pain (Neck Spondylitis), Middle Back-pain, Lower Back-pain or Tailbone-pain. The main symptoms of arthritis are joint pain and stiffness, which typically worsen with age. Ardha Chakrasana Ushtrasana Vakrasana Sarala Matsayasana Bhujangasana	The increase in uric acid in blood, can cause gout in synovial fluid around the joint. Infections or underlying disease, such as psoriasis or lupus, can cause other types of arthritis. Osteoarthritis; when the slippery tissue lining of the bones that covers the ends of bones gets damaged or break-down in which the immune system attacks the joints, beginning with the lining of joints. Gomukh Asana Bhadrasana Makarasana Nadi Shodhana	**Tadasana** : Same as earlier in Obesity Pg no. 71
			Urdhwa Hastottan Asana : Same as earlier in Asthma Pg no.78
			Ardha Chakrasana : It is Half Wheel Pose. From standing position start bending backward. Feet are together whereas hands can be at back or at waist. Neck and abdomen is bent backward while looking at back.
			Ushtrasana : Same as earlier in Obesity Pg no. 74
			Vakrasana : Same as earlier in Asthma Pg no. 79
			Sarala Matsayasana : Same as earlier in Hypertension Pg no. 80
			Bhujangasana : Same as earlier in Diabetes Pg no. 75
			Gomukhasana : Same as earlier in Diabetes Pg no. 77
			Bhadrasana : It is sitting with cross legged position while feet soles joined together and hands holding ankles. The spine is stretched up and hand relaxes over knees. Perform deep breathing or pranayams. Body becomes relaxed. Advance people can also sit in Siddh-asana or Padma-asana. This asana can be performed anytime even after the meal.
			Makarasana : It is resting in pro-lying position in which hands are in front under the head.
			Nadi Shodhana Pranayam : Same as earlier in Hypertension Pg no. 82

UNIT 4

PHYSICAL EDUCATION AND SPORTS FOR CWSN (CHILDREN WITH SPECIAL NEEDS-DIVYANG)

TOPICS & LEARNING OUTCOMES

1. **Organizations promoting Disability Sports (Special Olympics; Paralympics; Deaflympics) : This topic helps to understand the various sports organisation which are working for the disabled/impared people for their participation in sports activities.**
2. **Concept of Classification and Divisioning in Sports : This topic will help to understand various categories and classification of disability in sports.**
3. **Concept of Inclusion in Sports, its need, and Implementation.**
4. **Advantages of Physical Activities for Children with Special Needs : It gives us knowledge about how sports activities are helpful for disabled or impared people.**
5. **Strategies to make Physical Activities assessable for children with special needs: It guides us how we can proceed to provide sports activities for disabled or impaired people.**

INTRODUCTION

Today around 15% of the global population i.e., over a billion people lives with some form of disability, of whom 2–4% experience significant difficulties in functioning. This number is expected to be double to 2 billion by 2050. The World report on disability has shown the benefits of collaboration between agencies for increasing awareness and strong action to reduce this disability. **The World report on disability is directed at policy-makers, practitioners, researchers, academics, development agencies, and civil society. Physical education is not only meant for common fit person but also for physically challenged people (Divyang) who can participate with full enthusiasm in sports.** United Nation Human Right and Convention on the Rights of Persons with Disability (CRPD) has given the right to participate in games and sports like other persons. Disable persons are free to participate in these activities not only at National level but at International level like Special Olympic Bharat, Paralympic, Deaflympic and many more. We should encourage and boost such types of activities. Such societies play an important role to boost physical education programme for Children with Special Needs - Divyang. Many people with disabilities do not have equal access to health care, education and employment opportunities and experience exclusion from everyday life activities.

1. ORGANIZATIONS PROMOTING DISABILITY SPORTS

CONCEPT OF DISABILITY

Disability is an impairment that may be cognitive, developmental, intellectual, mental, physical, sensory, or some combination of these. It affects the everyday activities of the individual to a considerable amount. Disability is an injury that restricts the functions or movement of an individual. Disability is a medical condition which does not permit an individual to perform any activity or movement in a normal way.

There are various types of disability like physical or mobility or loco-motor disability; cognitive or learning disability; intellectual disability; sensory disability; psychological or mental disability; chronic neurological disability; multiple disability etc. There are many causes like birth defect, genetic default like cerebral palsy, muscular-skeletal problem, dystrophy; environmental causes like accident, head or spine injury, electric shock, polio, medical allergy, improper treatment, over tension, depression, traumatic shock, epileptic illness, poor diet, wrong habits, postural deformity, bits, etc. Disability affects the activities of daily living, such as eating, walking, and maintaining personal hygiene. Some people need special care to overcome these. Many of these people require assistive technologies such as low-vision devices, wheelchairs or hearing aids. **3rd December is celebrated as World Disability Day.**

There are many organizations which work for disabled people or physically/ mentally challenged people (Divyang). There are various organizations to provide them self esteem, respect in society, social inclusion, non-dependence, honour, courage, sports participation etc. These organizations help disabled people in many ways so that they should adjust well in society more over providing healthy atmosphere for participation in sports. These organizations provide training, coaching and guidance for participation in sports at every level like Paralympic, Special Olympic, Deaflympic and many more.

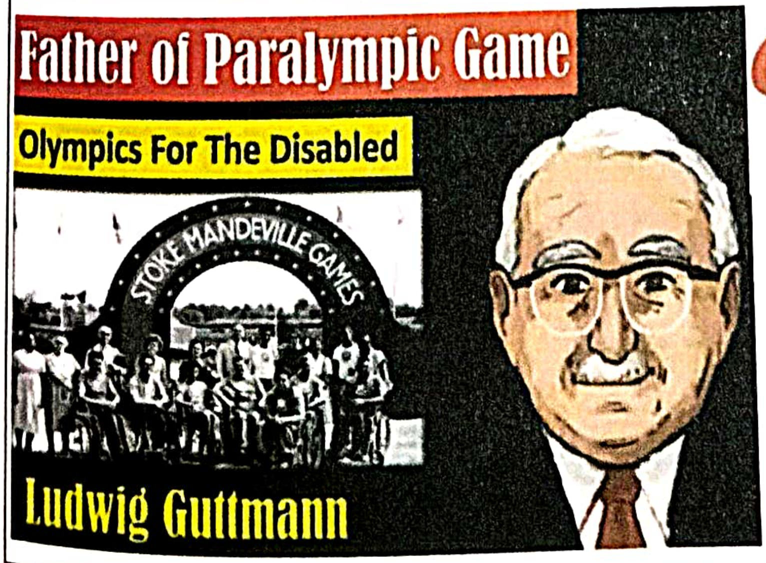
International Federation of Adapted Physical Activity (IFAPA), encourages international cooperation in the field of physical activity for the benefit of individuals of all abilities, to promote, stimulate and support research in the field of adapted physical activity throughout the world. It assists and guides the Paralympics, Special Olympics, Deaflympics and other organizations and agencies which work under it.

(A) PARALYMPICS

Paralympic started in the year 1960 at Rome (Italy). This is similar to Olympics for disabled sportsperson. The efforts of Sir Ludwig Guttmann made this first Paralympic possible. The headquarter of International Paralympic Committee (IPC) is at Bonn (Germany). The IPC is responsible for organising Summer and Winter Paralympic Games. The symbol of Paralympic Games is three colour (Red, Blue and Green) and motto is "Spirit in Motion".

PARALYMPIC COMMITTEE OF INDIA (PCI)

Paralympic Committee of India (PCI) is the governing body of Paralympic Sports in India formed in 1992. It is recognized by both, International Paralympic Committee (IPC). It works under the Ministry of Youth Affairs and Sports, Govt. of India. PCI develops and promotes Paralympic Sports with the help of



INTERNATIONAL
PARALYMPIC
COMMITTEE

PARALYMPIC COMMITTEE
INDIA

National Sports Federations and State Paralympic Associations affiliated to it. The Head Office of PCI is at Delhi. The objectives of this organization were to promote sports for the disabled of our country, identifying the disabled sportspersons at all India level, imparting necessary training to them, and preparing them to take part in State, National & International Sports meets was the major activity of this organization. There are many activities been participated by disabled people, some have standard rules and regulation whereas many of them are participated for recreation; to stay healthy or for body fitness. These activities should be encouraged and efforts should be done to motivate the disabled person for its participation.

PARALYMPIC ELIGIBILITY

The Paralympic Movement offers sport opportunities to para/disabled/impared athletes with physical, visual and intellectual impairments and these are divided into 10 eligible impairment types which must be permanent in nature. The presence of a permanent eligible impairment must be proven by means of medical diagnostic information that must be presented prior to athlete evaluation. The following are the Eligible Impairments recognized by the International Paralympic committee (IPC):

(*i*) Impaired Muscle Power: Reduced force generated by muscles or muscle groups, may occur in one limb or the lower half of the body. Examples include: spinal cord injury (complete or incomplete, tetra- or paraplegia), muscular dystrophy, post-polio syndrome and spina bifida.

(*ii*) Impaired Passive Range of Movement: Athletes with impaired range of movement have a restriction or a lack of passive movement in one or more joints. Examples include: arthrogryposis and contracture resulting from chronic joint immobilization or trauma affecting a joint.

(*iii*) Loss of Limb or Limb Deficiency: Athletes with limb deficiency have total or partial absence of bones or joints as a consequence of trauma (e.g., traumatic amputation), illness (e.g., amputation due to bone cancer) or congenital limb deficiency (e.g., dysmelia).

(*iv*) Leg-length Difference: Athletes that have a difference in the length of their legs as a result of a disturbance of limb growth, or as a result of trauma.

(*v*) Short Stature: Athletes with short stature have a reduced length in the bones of the lower limbs and/or trunk. Examples include: achondroplasia, growth hormone dysfunction, and osteogenesis imperfecta.

(*vi*) Hypertonia: Athletes with hypertonia have an increase in muscle tension and a reduced ability of a muscle to stretch caused by damage to the central nervous system. Examples include: cerebral palsy, traumatic brain injury and stroke.

(*vii*) Ataxia: Athletes with ataxia have uncoordinated movements caused by damage to the central nervous system. Examples include: cerebral palsy, traumatic brain injury, stroke and multiple sclerosis.

(*viii*) Athetosis: Athletes with athetosis have continual slow involuntary movements. Examples include cerebral palsy, traumatic brain injury and stroke.

(*ix*) Visual Impairment: Athletes with impaired vision have reduced or no vision caused by damage to the eye structure, optical nerves or optical pathways, or visual cortex of the brain. Examples include: retinitis pigmentosa and diabetic retinopathy.

(*x*) Intellectual Impairment : Athletes with an intellectual Impairment have a restriction in intellectual functioning and adaptive behaviour in which affects conceptual, social and practical adaptive skills required for everyday life. This Impairment must be present before the age of 18.

PARALYMPIC EVENTS

At Tokyo 2020 Paralympic, the following events were conducted for disabled : Archery, Para Athletics, Boccia, Canoe, Cycling, Equestrian, Football 5-a-side, Football 7-a-side, Goal ball, Judo, Para Power Lifting, Rowing, Sailing, Shooting, Para Sitting Volleyball, Para Swimming, Table Tennis, Triathlon, Wheelchair Basketball, Wheelchair Fencing, Wheelchair Rugby and Wheelchair Tennis.

Indian players had performed extremely well in recent Paralympics. Their performance and achievement in Tokyo Paralympics is as under.

Indian Medalist at Tokyo 2020 Paralympics

Medal	Name	Sport	Event
① Gold	Avani Lekhara	Shooting	Women's R2 10 metre air rifle standing SH1
① Gold	Sumit Antil	Athletics	Men's javelin throw F64
① Gold	Manish Narwal	Shooting	Mixed P4 50 metre pistol SH1
① Gold	Pramod Bhagat	Badminton	Men's singles SL3
① Gold	Krishna Nagar	Badminton	Men's singles SH6
② Silver	Bhavina Patel	Table tennis	Women's individual class 4
② Silver	Nishad Kumar	Athletics	Men's high jump T47
② Silver	Yogesh Kathuniya	Athletics	Men's discus throw F56
② Silver	Devendra Jhajharia	Athletics	Men's javelin throw F46
② Silver	Mariyappan Thangavelu	Athletics	Men's high jump T63
② Silver	Praveen Kumar	Athletics	Men's high jump T64
② Silver	Singhraj Adhana	Shooting	Mixed P4 50 metre pistol SH1
② Silver	Suhas Lalinakere Yathiraj	Badminton	Men's singles SL4
③ Bronze	Sundar Singh Gurjar	Athletics	Men's javelin throw F46
③ Bronze	Singhraj Adhana	Shooting	Men's P1 10 metre air pistol SH1
③ Bronze	Sharad Kumar	Athletics	Men's high jump T63
③ Bronze	Avani Lekhara	Shooting	Women's R8 50 metre Rifle 3 positions SH1
③ Bronze	Harvinder Singh	Archery	Men's individual recurve open
③ Bronze	Manoj Sarkar	Badminton	Men's singles SL3

(B) SPECIAL OLYMPIC

Special Olympics International was started by efforts of Eunice Kennedy Shriver (sister of former President of the United States of America, John F. Kennedy) first International Special Olympics Games in Chicago in July 1968. **It is a movement that uses sports to reform the lives of disabled persons (with in intellectual disability). It gives training and coaching to build the interest in sports, skill perfection, social interaction, communication skills, and talent and leadership abilities in intellectual disabled persons. Shriver believed that with equal opportunities and experiences as everyone else, people with intellectual disabilities could accomplish far more than ever thought possible.** She was convinced that children with intellectual disabilities could be exceptional athletes and that through sports they can realise their potential for growth.

SPECIAL OLYMPIC BHARAT (SOB)

In India, Special Olympic Bharat (SOB) formed in 2001; is an organisation approved by National Sports Federation and Special Olympic International (SOI) for the development of persons with intellectual disabilities. The mission of Special Olympics is to provide year-round sports training and athletic competition in a variety of Olympic-type sports for children and adults with intellectual disabilities, giving them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in sports events. The transformative power of sports in instilling confidence, improving health and inspiring a sense of competition lies at the core of Special Olympics. Special Olympic Bharat organises training and competition events at local, district, state, national and international levels. It is recognized by the Ministry of Youth Affairs & Sports, Government of India as a National Sports Federation in the Priority Category, for development of Sports for Persons with Intellectual Disabilities.

Special
Olympics
Bharat

Special Olympics Bharat organises training and competition events at local, district, state, national and international levels. It organises competitive events in 24 Olympic style individual and team sports events. The best performer is referred to attend National Coaching Camp supported by Sports Authority of India (SAI) to prepare for International Competitive events.

Special Olympics Bharat also gives training for coaches to deal with intellectual disabled persons. Special Olympics Bharat programme helps to improve the overall health and fitness of athletes by providing basic health check-ups, preventive treatments, educational information and referral for follow-up care, etc.

Special Olympics Bharat Objectives :

(*i*) Focus on holistic development and training that goes beyond the classrooms into the playing fields, cultural and community centres, to motivate children with disabilities to join and remain in school.

(*ii*) Create role models who will inspire the children and also motivate parents into sending their children to school and to participate in sports and other extra-curricular activities.

(*iii*) Train teachers to sensitise them to needs of special children, and create a cadre of physical education teachers from among the disabled who can work with schools and community centres.

(*iv*) Ensure maximum involvement of community for greater public understanding and acceptance of people with intellectual disabilities; most of our activities are run by local volunteers.

(*v*) Ensure all Special Olympics Bharat activates local, state, national and international reflect the Olympic movement values, standards, ceremonies and events.

(C) DEAFLYMPICS

Deaflympics (previously called World Games for the Deaf and International Games for the Deaf) are an International Olympic Committee (IOC)-sanctioned event at which deaf athletes compete at an elite level. Unlike the athletes in other IOC-sanctioned events (the Olympics, the Paralympics, and the Special Olympics), the Deaflympians cannot be guided by sounds (e.g., the starter's guns, bullhorn commands or referee whistles). The games have been organized by the Comité International des Sports des Sourds (CISS, "The International Committee of Sports for the Deaf") since the first event. In India, deaf sports acturtees are regulated by "All India Sports Council of the Deaf (AISCD). It is registered under IOA.

DEAFLYMPICS
Recognised by
International Olympic Committee

2. CONCEPT OF CLASSIFICATION AND DIVISIONING IN SPORTS

The classification for disability sports is used to facilitate fair competition among people with different types of amputations. This classification was set up by International Sports Organization for the Disabled (ISOD) and is currently managed by IWAS who ISOD merged with in 2005. Several sports have sport specific governing bodies managing classification for amputee sports people. **The classes for ISOD's amputee sports classification system are A1, A2, A3, A4, A5, A6, A7, A8 and A9. The first four (A1 to A4) are for people with lower limb amputations.** A5 to A8 are for people with upper limb amputations.

Cerebral Palsy Sport Classification is a classification system used by sports that include people with Cerebral Palsy (CP) with different degrees of severity to compete fairly against each other and against others with different types of disabilities. In general, Cerebral Palsy-International Sports and Recreation Association (CP-ISRA) serves as the body in charge of classification for cerebral palsy sport, though some sports have their own classification systems which apply to CP sportspeople. The classification system developed by the **CP-ISRA includes eight classes: CP1, CP2, CP3, CP4, CP5, CP6, CP7 and CP8. These classes can be generally grouped into upper wheelchair, wheelchair and ambulatory classes. CP1 is the class for upper wheelchair, while CP2, CP3 and CP4 are general wheelchair classes. CP5, CP6, CP7 and CP8 are ambulatory classes.**

The Les Autres class of disabilities generally covers two classes. These are people with short stature and people with impaired passive range of movement. The latter is sometimes referred to as PROM. There are a number of sports open to people who fit into Les Autres classes, though their eligibility often depends on if they have short stature or PROM. Historically, disability sports classification has not been open specifically to people with transplants, diabetics and epileptics. This is because disabilities need to be permanent in nature.

Classification for disability sports generally has three or four steps. The first step is generally a medical assessment. The second is generally a functional assessment. This may involve two parts: first observing sportspeople in training and then involving observing sportspeople in competition. There are a number of people involved in this process beyond the sportsperson including individual classifiers, medical classifiers, technical classifiers, a chief classifier, a head of classification, a classification panel and a classification committee.

3.(A) CONCEPT OF INCLUSION

Inclusion can be defined as the act or state of being part of something larger. Inclusion in education is an approach to educating students with special educational needs. In a social context, inclusion means every person has the possibility to participate fully and equally in all social processes - right from the beginning and regardless of individual skills, ethnic - or social origin, sex or age.

According to Norwich, "Inclusion is something which cannot be done to people, it is something in which people are actively involved". By valuing and respecting human diversity, the practice of inclusion fosters a sense of community and belonging, enabling all people to participate in every area of life.

Under the inclusion model, students with special needs spend most or all of their time with normal students. Inclusion rejects the use of special schools or classrooms to separate students with disabilities from normal students.

> *"Inclusive Education is defined as a learning environment that promotes the full personal, academic and professional development of all learners irrespective of race, class, colour, gender, disability, sexual preference, learning styles and language."*

3.(B) NEED OF INCLUSION

***(i)* Molds the Values of the Next Generation :** Students should see the person first and the disability second. Students learn empathy and the value diversity.

***(ii)* Provides Opportunities for Friendship :** The development of friendship requires a close proximity and a common experience. Keeping children together encourages both objectives. Students develop a comfortable way to interact with students with disabilities. Children with disabilities attend the same school as their neighbourhood friends.

(iii) **Prepares Individuals for Adult life** : Today's classmates are tomorrow's employers. Community life is not divided into "typical" community and "special" community. Maintain a typical family structure in your life. Siblings can be study together at the same school. Parents are not stretched between two or more settings.

(iv) **Cultivates an Enriched Learning Environment** : Additional resources (therapists, special educators, etc.) in the classroom give benefit to all children. Diversified teaching strategies and the common use of modifications and adaptations are useful to all children. Children with disabilities learn from typically developing peers who can act as role models, making them more likely to develop appropriate social and communication skills.

(v) **Improves Social and Communication Skills:** Inclusive education provides ample opportunities for all students. Students with disabilities and those without disabilities have better social relations among themselves.

(vi) **Builds Self Esteem** : Inclusive classrooms should be filled with diverse learners. This lets kids observe and talk about diverse learning patterns and the manner in which everyone learns in their own way.

(vii) **Enhances Academic Performance:** Inclusive education leads to better academic performance than in exclusive education.

(viii) **Improves Performance:** Since the expectations of all the children are higher in a mixed abilities classroom, inclusion attempts to develop an individual's strengths and gifts by stretching each individual to optimal performance.

3.(C) IMPLEMENTATION OF INCLUSION

Implementation of these practices varies. Schools most frequently use the inclusion model for selected students with mild to moderate special needs. Fully inclusive schools, which are rare, do not separate "general education" and "special education" programmes; instead, the school is restructured so that all students learn together.

Inclusive education differs from the 'integration' or 'mainstreaming' model of education, which tends to be concerned principally with disability and special educational needs, and learners changing or becoming 'ready for' or deserving of accommodation by the mainstream. By contrast, inclusion is about the child's right to participate and the school's duty to accept the child.

4. ADVANTAGES OF PHYSICAL ACTIVITIES FOR CHILDREN WITH SPECIAL NEEDS

The benefits of physical activities are universal for all children, including those with disabilities. Disabled person are taught in Inclusion Schools so that they fit in society, moreover, normal people can understand their needs. All children can get benefit from the exercise and pure enjoyment of playing sports. This also includes children with special needs. Special needs children are sometimes not encouraged to exercise because their parents or guardians fear they will be hurt. Physical activity is as important for special children. The advantages are as under :

(i) **Physical Benefits** : Scientific studies into disability groups have demonstrated that participation in physical activity and sport leads to improved levels of well-being and physical health.

(ii) **Better Psychological Health** : The psychological health becomes better by doing physical activities for children with special needs.

(iii) **Overall Health Improvement** : Physical activities provide good health and proper functioning of internal organs. Thus, the overall efficiency gets improved.

(iv) **Provides Fun and Recreation.** : Physical activities provide fun and recreation thus refreshes and re-energies. It helps to reduce stress, anxiety and depression level in disabled children.

(v) **Improves Social Abilities** : Physical activities provide ample opportunities for improving social skills and social interactions among CWSN.

***(vi)* Better Emotional Balance** : Physical activities help the children with special needs by controlling and balancing their emotions and also give them enjoyment.

***(vii)* Overcoming Health Problems** : Physical activity for CWSN helps to keep them away from health problems, diseases, illness etc.

***(viii)* Improves Cognitive Learning** : The energetic nature of physical education leads to cognitive and intellectual improvements in CWSN, allowing them to develop skills that they may not develop in a traditional classroom setting.

***(ix)* Improvement in Physical Skills** : Physical activities performed by disabled person improves their physical skills abilities thus body output improves.

***(x)* Improves Fitness Level** : Physical activities improve their fitness level thus their workout ability also increases.

***(xi)* Control of Weight** : Physical activity helps in controlling excess of weight. Thus, they becomes active and improves physical personality.

***(xii)* Channelising the Surplus Energy**: Children with disabilities like ADHD display hyperactivity that if appropriately directed, can bear positive results regarding cognitive benefits and constructive behaviour.

***(xiii)* Increased Independence**: Participation in physical activities is a mode to transit towards greater independence due to improved daily life skills. For a person with a disability, an increase in physical activity can lead to more independence and freedom.

5. STRATEGIES TO MAKE PHYSICAL ACTIVITIES ASSESSABLE FOR CHILDREN WITH SPECIAL NEED

Physical activities for disabled children are specifically designed programmes with special need considering the type of disability or disorder. Physical education programmes in a modified way help in the development or teaching or recreation and play of disabled person.

Adapted or specially designed Physical Education (APE) is about meeting the unique needs of individual students with disabilities. In APE, the instructor provides planning and assessment, consultation for general physical education teachers, specially designed instruction, and adapts or modifies the curriculum, task, equipment, and/or environment so that a child can participate in all aspects of physical education. APE and general physical education teachers work together to design meaningful and beneficial instructions for all students.

Many students with disabilities can safely and successfully participate in general physical education, with or without accommodation and support. However, some children get benefit from specially designed or adapted physical education. Contents in adapted physical education should mirror the general physical education curriculum to the greatest possible extent; because physical education is a required component of special education. It includes lot of strategies to make physical activity assessable for CWSN such as :

***(i)* Medical Check-up** : The activities for children with special needs should be started by proper medical check-up.

***(ii)* Activity According to Individual Abilities** : The physical activities are specifically and specially designed for the individual according to his/her ability.

***(iii)* Activities Based on Interests** : Physical activities must be based on the interest, aptitude, ability, previous experience and limitations of children with special needs.

***(iv)* Modified Equipments** : Equipments are specially designed and modified according to individual needs.

(v) **Simple and Easy Rules** : The physical activities for disabled people are having simple and easy rules, moreover, it should be graded as specified by Paralympics.

(vi) **Motivated to Participate Freely** : The activities designed for them should encourage the participation freely and independently.

(vii) **Well-Instructed and Properly Trained** : Before participation in physical activity, they should be well-instructed. Sufficient training and practice should be given to the students or individuals who are participating in such activities.

(viii) **Encouragement from Spectators** : These people should be encouraged irrespective of error. They should also be motivated to participate with normal people if possible, whereas care should be taken that they should not get hurt (physically or mentally).

(ix) **Suitable Environment** : Their activities should be arranged in a suitable environment away from pollution, noise or any kind of danger. They should participate in a clean, safe and hygienic environment.

(x) **Participation Under Experts** : They should always participate under experts' observation with full safety measures.

(xi) **Sufficient Free Space** : While dealing with CWSN, there should be sufficient free space for activities.

Some Important Questions

Multiple Choice Questions (MCQs)

1. Which of the following activities are a part of Paralympic Games ?
   (*a*) Football and Rowing
   (*b*) Wheelchair Basketball and Bocce
   (*c*) Wheelchair Tennis and Shooting
   (*d*) All of these
2. The meaning of CWSN is :
   (*a*) Children with Social Needs
   (*b*) Children with Sensory Needs
   (*c*) DIVYANG
   (*d*) Children with Special Needs
3. The founder of Special Olympic is :
   (*a*) Baron de Coubertin
   (*b*) John F. Kennedy
   (*c*) Sir Ludwig Guttmann
   (*d*) Eunice Kennedy Shriver
4. The motto of Paralympic is :
   (*a*) Citius, Altius, Fortius
   (*b*) Spirit in Motion
   (*c*) Ever Onward
   (*d*) Fight for Justice
5. Which is not the advantage of physical activity for CWSN?
   (*a*) It reduces their physical efficiency
   (*b*) It increases their health problem
   (*c*) It increases their stress
   (*d*) All of these
6. The organization controlling and guiding Special Olympics Bharat is :
   (*a*) IOC (*b*) IOA (*c*) SOI (*d*) IPC
7. When did Special Olympics Bharat established in India ?
   (*a*) 1947 (*b*) 1990 (*c*) 2001 (*d*) 1968
8. Who is the controlling body of Paralympics ?
   (*a*) IOC & IOA (*b*) IPC & PCI (*c*) SOI & SOB (*d*) All

UNIT 5

SPORTS AND NUTRITION

TOPICS & LEARNING OUTCOMES

1. **Concept of Balance Diet and Nutrition : We will understand about Nutrition and Balanced diet ; functions of balanced diet.**
2. **Macro and Micro Nutrients : Food sources and functions: In this topic we will understand Macro and Micro nutrient and factors affecting diet.**
3. **Nutritive and Non Nutritive Components of Diet : This topic help to give understand about Nutritive and non-nutritive components of diet (Fats, Carbohydrates, Proteins, Vitamins, Mineral, Water, Roughage); its function; its sources ; their deficiency diseases etc.**
4. **Eating for Weight control – A Healthy Weight, The Pitfalls of Dieting, Food Intolerance, and Food Myths : To make the student aware of eating for weight loss and results of the pitfalls of dieting. To understand food intolerance and food myths.**
5. **Importance of Diet in Sports-Pre, During and Post competition Requirements**

INTRODUCTION

Food is essential for survival. Human beings take different types of food in their diet; it may be liquid food or solid (hard) food. These things which we eat give energy to our body for performing work in a proper way. Our body grows, develops and functions properly with the help of macro and micro nutrients in the food. The food contains various types of nutrients in it. Food refers to any substance that nourishes our body or in other words, it is anything that we can digest, absorb and utilize, for various physiological functions of the body including growth and development. Food provides nutrition to the body. The chemical substances which are present in food are called nutrients. Nutrients include carbohydrates, proteins, fats, vitamins, minerals, water and fiber (roughage). Different food stuffs contain these nutrients in different amounts and proportions and our body needs each nutrient in a certain specific amount for various physiological functions and overall growth and development. Some nutrients are needed in larger amounts, these are called macronutrients. Nutrients like carbohydrates, proteins and fats along with water are macronutrients. Other nutrients like vitamins and minerals are required in small amounts and are called micronutrients. This chapter will help us to understand Balanced Diet and its importance. It will also give knowledge related to various elements and components of diet, factors affecting diet, sports diet, etc.

1. CONCEPT OF BALANCED DIET AND NUTRITION

(A) NUTRITION

The energetic food in our diet for growth and development is known as "Nutrition." The science which deals with nutritious diet and its importance for the individual is known as 'Nutrition'. The nutritious diet directly affects the health of an individual. Nutrition is the science of food and a study of the process that includes everything happens to food from the time it is eaten until it is used for various functions in the body. It is the scientific study of foods and the nutrients therein; their action and interaction and balance, in health and diseases. It is the study of ingestion, digestion, absorption, utilization and assimilation of nutrients present in food.

It is well known that food is essential for survival. Food refers to any substance that nourishes our body or in other words, it is anything that we can digest, absorb and utilize, for various physiological functions of the body including growth and development. Food provides nutrition to the body. These chemical substances which are present in food are called nutrients.

Food is the basic requirement of every individual to fulfill the energy needs and to meet the development of the body. The food which we eat is known as 'Diet'. The energetic food in our diet consists of various types of essential chemicals for our body termed as 'Nutrients'.

Nutrients include carbohydrates, proteins, fats, vitamins, minerals, water and fiber (roughage). Different food stuffs contain these nutrients in different amounts and proportions and our body needs each nutrient in a certain specific amount for various physiological functions and overall growth and development. Some nutrients are needed in larger amounts, these are called macronutrients whereas some are required in small amounts and are called micronutrients. Each of these nutrients plays a significant role in the body.

(B) BALANCED DIET

The diet which provides energy for workout along with growth and development of body is known as 'Balanced Diet'. It provides sufficient energy for workout and helps in the growth and development of an individual. Moreover, it protects individual from various health problems, illness and diseases. **Balanced diet contains all nutrients (macro and micro) like carbohydrates, fats, proteins, vitamins, minerals, water, etc. in correct proportion for efficient working of body and also fulfills the growth and development needs of body to ensure good health of an individual.**

Balanced Diet

Balanced diet is divided into three parts :

I. ENERGY YIELDING FOOD : It consists of carbohydrates and fats. This food helps to provide energy to individual for his workouts or activities. The carbohydrates should be 60 to 70 per cent in our diet whereas majority of carbohydrates should be complex carbohydrates. The fat or lipid contents should not exceed 5 to 10 per cent in our diet. Carbohydrates are easy and good source of energy whereas fats are difficult to digest and hence difficult to get energy from it. Thus, fats should be less in our diet. Moreover, they cause the chances of overweight, obesity and heart diseases.

Main Sources : Cereals (wheat, rice, jowar, bajra, etc); Root Vegetables (potato, sweet potato etc); Sugar (table sugar and jaggery/ gur etc); Lipid/ Fats (desi ghee, ghee, oils, butter, animal fats, fried food, etc).

II. BODYBUILDING FOOD : It consists of proteins. It helps in the growth and development of body. It helps to repair or replace the worn out tissues. It provides faster recovery from injury. Proteins should be 15 to 20 per cent in our diet.

Main Sources : Dairy products (milk, paneer/ cheese etc); Meat products (egg, meat, fish etc); Pulses/ Dals (kidney beans, red grams/ lobia, channa, channa dal, green dal etc); Nuts and Seeds (groundnut, almonds, cashew, til seeds).

III. DEFENSIVE FOOD : **It consists of Vitamins, Minerals, Fibre and water. This food helps in proper functioning and defense of various organs. This diet improves the immune system of the body, thus it helps to defend against infection, germs, diseases, etc.** Defensive food should be 15 to 20 per cent in our diet. Apart from this one should drink 3 to 5 litres of water to maintain water balance of the body.

Main Sources : Fruits and Vegetables (almost all fresh and seasonal fruits and vegetables).

(C) FUNCTIONS OF BALANCED DIET

(*i*) Sufficient Energy : Balanced diet provides sufficient energy for the various activities of the individual.

(*ii*) Optimum Growth and Development : It helps individual to grow and develop to optimum level. Thus, fullest of growth and development can take place.

(*iii*) Proper Functioning of Organs : Balanced diet helps various organs and various systems of body to function properly.

(*iv*) Faster Recovery : It helps to repair or replace the worn-out tissues, thus, faster recovery from injury.

(*v*) Efficient Immune System : Balanced diet improves the defence of body against various bacteria, virus and fungal diseases, thus efficient immune system.

(*vi*) Improves Health Status : This diet helps to improve the overall health status of the individual by preventing various health problems and diseases.

(*vii*) Improves Metabolism : Balanced diet improves the quality of metabolism processes of our body, thus efficient release of energy.

(*viii*) Prevents Deficiency Diseases : Balanced diet prevents individual from various deficiency diseases as it provides all important nutrients.

(*ix*) Maintaining Body Weight : It helps individual to maintain proper body weight.

(*x*) Overall Efficiency Improves : As balanced diet increases the efficiency of all physiological systems of body, thus overall efficiency of individual improves.

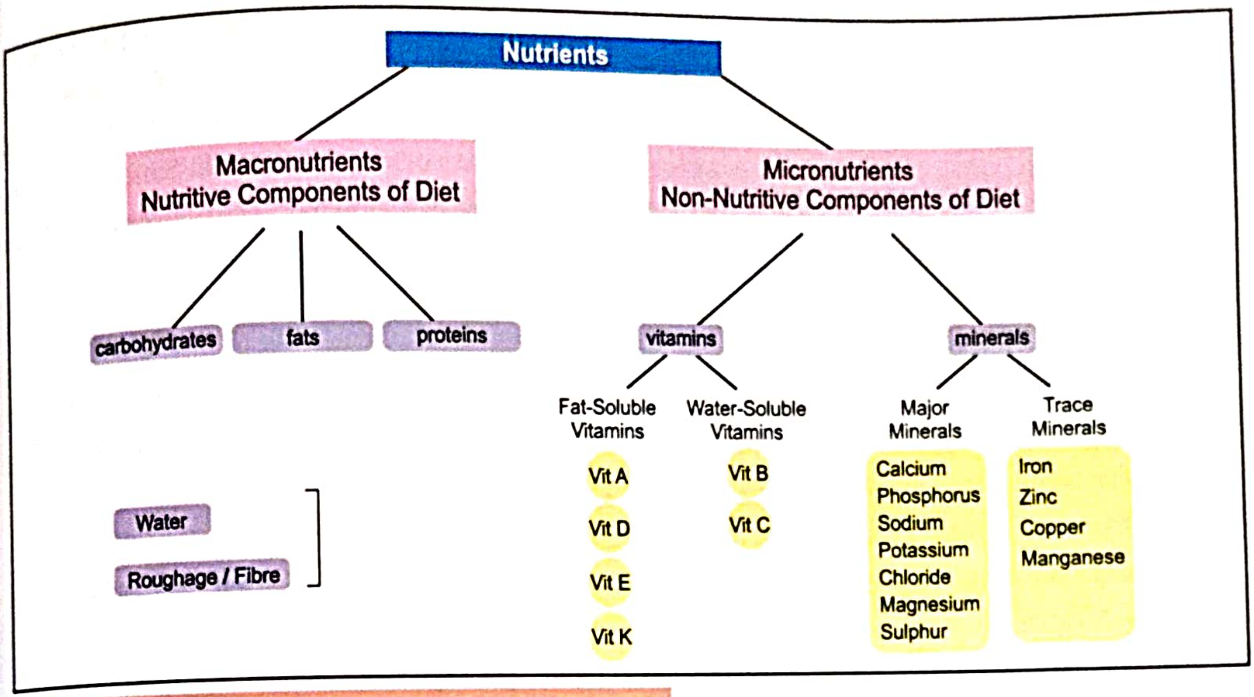
2. MACRO AND MICRO NUTRIENTS

(A) MACRO-NUTRIENTS

These are required in large proportion in our diet like Carbohydrates, Fats, Proteins and water. They are also called as 'Proximate Principles'. Macronutrients include mostly Carbon, Hydrogen, Oxygen and Nitrogen. They are the main part of diet and are taken in large quantity in our diet. They are main source of energy and important for body growth & development. These are mostly nutritive component of diet.

(B) MICRO-NUTRIENTS

Micro-nutrients are required in small proportion in our diet like vitamins and minerals. They act as defensive food and help the proper functioning of various organs of the body. These are mostly non-nutritive component of diet.


Nutrients
Macronutrients
Nutritive Components of Diet
Micronutrients
Non-Nutritive Components of Diet
carbohydrates
fats
proteins
vitamins
minerals
Fat-Soluble Vitamins
Water-Soluble Vitamins
Major Minerals
Trace Minerals
Vit A
Vit D
Vit E
Vit K
Vit B
Vit C
Calcium
Phosphorus
Sodium
Potassium
Chloride
Magnesium
Sulphur
Iron
Zinc
Copper
Manganese
Water
Roughage / Fibre

FACTORS AFFECTING MACRO AND MICRO DIET

(i) **Age** : Age plays an important role in diet preparation, like in growing age the children need more proteins (to meet growth patterns). In old age people should avoid proteins and fats but take more minerals and vitamins.

(ii) **Gender** : Gender (sex) difference causes variation in diet. Male needs more calories as compared to female (due to physiological and activity needs of the body).

(iii) **Workout or Profession** : Person with heavy physical workout needs more calories than those with less physical activity.

(iv) **Body Weight** : The weight also brings difference of diet. Overweight or obese person should take fibrous food whereas slim or lean (underweight) person needs more proteins and fats.

(v) **Specific Sports Diet** : Various sports activities need specific diet like a long distance runner needs more fats; in contact body games player needs more proteins; explosive strength player needs more carbohydrates; in skill games player needs more amount of vitamins and minerals, etc.

(vi) **Sufficient Roughage** : Roughage is non-nutritive but very essential. Roughage consists of lot of fibers like in fruits and vegetables. It satisfies the hunger.

(vii) **Pregnant or Feeding Mother** : A pregnant or feeding mother needs extra diet, i.e., more amount of carbohydrates, proteins, fats, vitamins and minerals. It should be given throughout the day rather than in big meals.

(viii) **Diet During Health Problems** : Injured person should take more of proteins and minerals, whereas ill or weak patient is given light meal along with minerals and vitamins. A diseased person has to follow the instructional food as per dietician or Doctor's recommendation.

(ix) **Seasonal Food** : Seasonal food is easily available and economical; moreover, the nutritional value is high.

(x) **Climatic Conditions** : This also affects the diet, like in hot places the food should be less fried ; in coastal region the food should be more liquid ; in cold places food should contain more proteins and fats.

(xi) **Natural Diet** : Natural sources of diet are easily digested by body. It is also less polluted and does not contain synthetic food.

***(xii)* Doctor's Recommendation** : A diseased or sick person should go according to Doctor's recommendation, like heart patient should avoid fried or fatty food; Jaundice patient should avoid proteins, etc.

***(xiii)* Eating Habits and Social Customs** : Eating habits and social customs also affect the diet of individual. Some people are in the habit of eating fast food whereas others do not like it. Similarly, in some customs preference is given to non-vegetarian food whereas in some customs preference is given to vegetarian food only.

FACTOR AFFECTING NON-NUTRITIVE FOODS

Non-Nutritive or Anti-Nutritional Factors (ANFs) factors that interfere with nutrient absorption, are those biological compounds present in human or animal foods that reduce nutrient utilization or food intake, thereby contributing to impaired gastrointestinal and metabolic performance. These include:

***(a)* Phytates** : These are abundantly found in unrefined cereals and millets. These phytates bind iron, zinc, calcium and magnesium and make these nutrients unavailable for digestion. On germination the phytate content is reduced.

***(b)* Tannins** : These are present in legumes, millets like bajra, ragi, spices, tamarind, tea, turmeric and in certain vegetables and fruits. Tannins interfere with iron and protein absorption.

***(c)* Trypsin Inhibitors** : These inhibit the activity of trypsin in the gut and interfere with digestibility of dietary proteins and reduce their utilisation. These are present in soya bean, duck egg etc. Heat treatment inactivates trypsin inhibitors.

***(d)* Oxalates** : These are present in green leafy vegetables and some legumes. These interfere with calcium absorption.

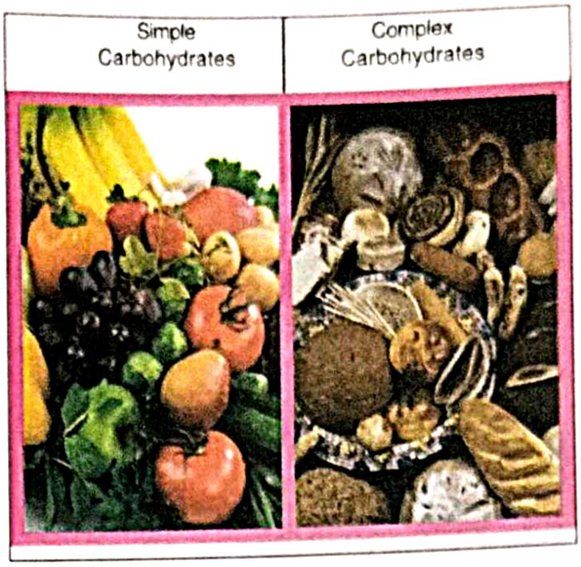
***(e)* Goitrogens** : These are also known as anti-thyroid substances as these interfere with iodine uptake by thyroid gland and may contribute to development of iodine deficiency disorders when iodine intakes are marginal. These are present in cabbage, cauliflower, turnips, soyabean, bajra, peanuts, and lentils.

3.(A) NUTRITIVE COMPONENTS OF DIET

(A) CARBOHYDRATES

Carbohydrates are the main source of energy for almost all activities of an individual. They provide quick energy to body and are not stored in our body for longer duration. Carbohydrates are the compounds of Carbon, Hydrogen and Oxygen with chemical formula CHO. On an average one gram of carbohydrates gives 4 calories of energy on burning. **Dieticians recommend 60 to 70 per cent of carbohydrates in our diet (where majority of the content should be complex carbohydrates.** Excess amount of carbohydrates get converted into glycogen and stored in liver and adipose tissues under the skin. Fewer amount of carbohydrates in diet cause Marasmus, under-nutrition and weight loss. **There are two types of carbohydrates – Simple carbohydrates and complex carbohydrates.**

(I) SIMPLE CARBOHYDRATES : Simple carbohydrates are made up from Monosaccharide carbohydrates like glucose from sugar, fructose from fruits, lactose from milk and galactose. They are used as immediate energy providers and also name as quick energy food. All simple carbohydrates contain sugar and gives immediate sweetening effect. **They are rich source of Vitamin and Minerals.**



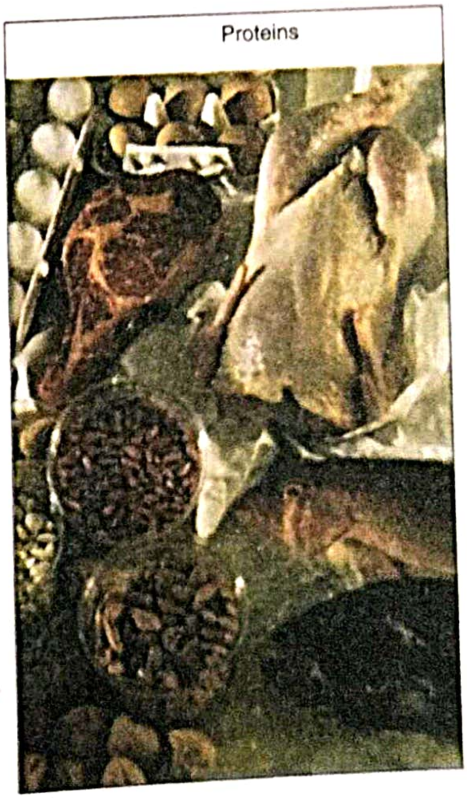
Simple Carbohydrates | Complex Carbohydrates

Sources : Simple carbohydrates are found in fruits like guava, apple, banana, orange, pineapple etc; low fat milk, table sugar, candy, jaggery/ gur, honey, jam, vegetables (sweet potato, carrot), etc.

(II) COMPLEX CARBOHYDRATES : Complex **carbohydrates are made-up from Disaccharides and Polysaccharides.** It provide most of the energy for our daily workout. Disaccharide carbohydrates consists of two monosaccharides combined together like Maltose (glucose + glucose), Lactose (glucose + galactose) and Sucrose (glucose + fructose). Polysaccharides consist of more than two monosaccharides and they are named as Starch and Fibers. Starch combines to form glycogen in body and glycogen releases slow energy as compared to simple carbohydrates whereas energy content is higher. However, fiber consists of cellulose and other large carbohydrate molecules; it cannot be digested in the human digestive tract. Excess amount of complex carbohydrates are stored in liver and tissues from where they release the energy when in need. It also gives sweetening affect after long chewing. The deficiency of complex carbohydrate causes Marasmus, under-nutrition and weight loss.

Sources : Complex carbohydrates are found in cereals (Wheat, Rice, Maize, Bajra), whole pulses (Chana-Dal, Moong-Dal, Rajma), bread, pasta etc. Many food items contains high fibers like green leafy vegetables, peas, beans, carrot, root vegetables, etc.

(B) PROTEINS



Proteins

Proteins are also named as Amino acids. They are required for the basic structures of all living cells, for muscles growth and repair of body tissues etc. Proteins are complex organic compounds and form the chain of amino acids containing Nitrogen, Carbon, Hydrogen and Oxygen. Amino acids are found in body like muscles, tendons, ligaments, organs, skin, hairs, nails, glands and body fluids like enzymes, hormones and blood etc. Dietician recommends 10 to 15 per cent of proteins in our daily diet. The daily requirement of proteins in our diet should be one gram per kilogram (1g/kg) of body weight. Under proteins diet slows down the growth and development along with delayed recovery from injury. Protein deficiency disease is Kwashiorkor. High intake of proteins also creates overload over kidneys, liver moreover, it leads to dehydration. It does not provide energy in normal routine whereas it acts as energy source only under extreme starvation (hunger). Proteins requirement depend upon individual's activity on daily basis like tissue growth, injury, pregnancy, etc. There are two types of Proteins or Amino acids :

(I) ESSENTIAL PROTEINS : **There are around 20 amino acids; of which 9 are called as Essential Amino Acids (EAA) and cannot be synthesized or produced by body.**

Sources : The sources of essential proteins (EAA) are pulses, milk, dairy products, soya-beans, egg, meat, etc. They are required for growth of tissues.

(II) NON-ESSENTIAL PROTEINS : **There are more than 11 non-essential proteins or Non-essential Amino Acid (NAA). Body requires them in very less quantity as help in the synthesis of essential proteins.**

Sources : The sources of non-essential proteins are grains, dry-fruits like almond/ badam, cashew nut, seeds of vegetables etc.

(C) FATS OR LIPIDS

Dietary oils and fats are forms of Lipids and they are not soluble in water. Oils remain in liquid form at room temperature; whereas fats are solid at room temperature. Lipids contain molecules of hydrocarbon and form fatty acids. They are most concentrated sources of energy in food. Fats are important for proper functioning of glands and other internal organs. Fats help in storing and transportation of various fat soluble vitamins like A, D, E and K. Fats help during blood clotting, maintenance of skin and hair. Our diet should consist of 5 to 10 per cent of fat. Higher intake of fats increases the risk of obesity and many heart diseases. On an average one gram of fat on burning gives 9 calories of energy. Fats are stored in body and are used as emergency source of energy. Fats act as source of energy during long duration workout. Extra amount of Fat get stored under the skin in the form of fatty acids. Lipids are important sources of energy for long endurance activities. Deficiency of fats causes Marasmus. There are two types of fatty acids :

Saturated and Unsaturated Fat

(I) SATURATED FATTY ACIDS (SFA) : **Saturated fats are also animal fats and they remain solid at room temperature. It contains chain of hydrocarbon molecules and they have sticky quality.** Saturated fats (Trans fatty acids) increase the risk of heart diseases by increasing bad cholesterol (Low Density Lipids or LDL).

Sources : They are found in food items like Animal fat (Pork, Red Meat), Dairy products (Cream, Butter, Desi Ghee), Oils (Coconut oil), Baked products (Pastries, Cookies, Biscuits, Namkeen), Fried food etc.

(II) UNSATURATED FATTY ACIDS : **This fatty acid largely comes from plants and remains in liquid form at room temperature. The bonds of hydrocarbon are mostly monounsaturated fatty acids (MUFA) or polyunsaturated fatty acids (PUFA). It reduces blood cholesterol and reduces heart diseases.**

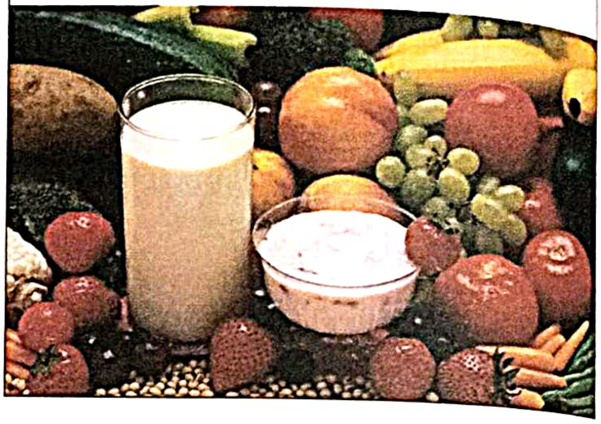
Sources : The sources of unsaturated fatty acids are Oils like Peanut, Olive, Soya-bean, Rice, Til (Seasame), Mustard, Sunflower, Vegetable oils, Dry fruits like Walnuts, Flax seeds, corn, etc.

Nutritive Components of Diet, Required for; Deficiency Diseases and Sources

Nutrient	Component	Required for	Deficiency Disease	Sources
Simple Carbohydrates	Compounds of Carbon, Hydrogen and Oxygen made-up from Monosaccharide carbohydrates. Macro Energy Nutrient	Immediate energy for anaerobic activities.	Low energy level	Contain sugar sweetening effect; found in fruits (banana, grapes, guava, pineapple, fruit juices), low fat milk, table sugar, honey, jam, jaggery/ gur, candy, vegetables (potato, carrot) etc..
Complex Carbohydrates	Made-up from Disaccharides and Polysaccharides. Macro Energy Nutrient	Workout energy for aerobic activities.	Low energy level, Marasmus	Contain glycogens (sweetening effect after long chewing); found in cereals (wheat, rice, maize, bajra), whole pulses, bread, etc.
Saturated Fatty Acids (SFA) or Saturated Lipids	Solid form at room Temperature, sticky quality; Macro Energy Nutrient	High energy used in emergency and storage of some vitamins.	Low testosterone, deficiency of fat soluble vitamins; excess causes heart diseases/problems	Animal fat (pork, red meat), dairy products (cream, butter, desi ghee), oils (coconut oil), baked products (pastries, cookies, biscuits, namkeen), fried food etc.
Unsaturated Fatty Acids or Unsaturated Lipids	Liquid form at room temperature. Mostly mono-unsaturated fatty acids (MUFA) or polyunsaturated fatty acids (PUFA).Macro Energy Nutrient	High energy used in emergency and storage of some vitamins.	Deficiency of fat soluble vitamins	Oils like peanut, olive, soya-bean, rice, til / sesame, mustard, sunflower, vegetable oils, dry fruits like walnuts, seeds, corn, etc.
Essential Amino Acids (EAA) or Proteins	Chain of Amino acids containing Nitrogen, as main part. Macro Growth Nutrient.	Growth and repair of tissues of body	Excess causes Heart problems Kwashiorkor	Contain complex amino acids; found in pulses, milk, dairy products, soya beans, egg, meat, etc
Non-Essential Amino Acids (NEAA) or Protein	Macro Growth Nutrient	Assist growth and repair of special tissues.		Contain complex amino acids; found in dry fruits like almond, cashew nut, seeds of fruits and vegetables, etc.

3.(B) NON-NUTRITIVE COMPONENTS OF DIET

(A) VITAMINS Vitamins are complex compounds of Carbon. They are very essential for normal functioning or working of body. Vitamins are required in very small amount to keep our body healthy. Vitamins are the important constituent of food required for metabolism of fats and carbohydrates. They do not provide energy but help to repair and maintenance of various tissues. However, if our diet is lacking in these vitamins, they cause certain diseases known as Deficiency Diseases. There are 13 vitamins but the important Vitamins are A, B, C, D, E and K. Most of the vitamins are obtained from our food except vitamin D and K which are produced by body. Vitamins are divided into two groups :


Vitamin Food

FAT-SOLUBLE VITAMINS : These vitamins are soluble in fat. They come into our body through fats and they are stored in liver and fatty tissues. These vitamins are A, D, E and K. These are required in small quantities and can cause harm if taken in excess.

WATER-SOLUBLE VITAMINS : Vitamins B and C are soluble in water. They are not stored in body, so we need them more frequently. These vitamins can be destroyed by heat.

Non-Nutritive Components of Diet (Vitamins) : Required for; Vitamins Deficiency Diseases and Sources

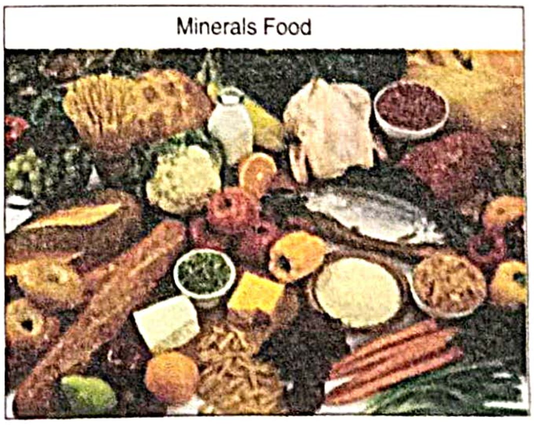
Nutrient	Component	Required for	Deficiency Diseases	Sources
Vitamin-A (Retinol)	Fat Soluble Vitamin	Growth and development of Eyes and Skin.	Night Blindness, Xerophthalmia	Found in milk, butter, egg york, carrot, cheese, liver oil, dark green leafy vegetables, carrot, mango, papaya, pumpkin, spinach, etc.
Vitamin-D (Sunshine Vitamin)	Fat Soluble Vitamin	Formation of strong Bones and Teeth help to store Calcium in body.	Rickets	Found in milk, butter, green leafy vegetables, fish, sunlight, etc.
Vitamin-E	Fat Soluble Vitamin	Protect the Cell Membrane and acts as Antioxidant, helps to control behaviour.	Skin problem, Fertility problem, Neuron diseases.	Found in whole seeds or grains, nuts, turmeric, etc.
Vitamin-K	Fat Soluble Vitamin	Helps in Blood Clotting and heals wounds.	Delayed healing of injuries	Found in cabbage, cauliflower, spinach, cereals, soya beans, green leafy vegetables, etc.

Vitamin-B1 (Thiamin)	Water Soluble Vitamin. Over heating destroys Vitamin B.	Helps in energy metabolism, improves nerve functioning. Synthesis of DNA & RNA.	Beri-Beri	Found in milk, egg, sprouted grains, whole cereals, mushroom, vegetables, peas, beans, etc
Vitamin-B2 (Riboflavin)	Water Soluble Vitamin. Over heating destroys Vitamin B.	Helps in energy metabolism, improve nerve functioning Growth of WBC's.	Low immunity, easily infected	Found in milk, egg, sprouted grains, whole cereals, green leafy vegetables, brocoli, peas, beans, etc.
Vitamin-B3 (Niacin)	Water Soluble Vitamin	Helps energy metabolism, improves skin sensitivity.	Pellagra	Found in milk, egg, sprouted grains, cereals, vegetables, peas, beans, etc.
Vitamin-B9 (Folic Acid)	Water Soluble Vitamin. Over heating destroys Vitamin B.	Helps energy metabolism, improve immunity and blood circulation, reduces Cancer risk, DNA growth, Growth of WBC's.	Low immunity, easily infected, Cancer risk.	Found in milk, egg, sprouted grains, whole cereals, green leafy vegetables, broccoli, cabbage, cauliflower, peas, beans, etc.
Vitamin-B12 (Cobalamin)	Water Soluble Vitamin	Growth of RBC's; helps nervous system, metabolism processes	Beri-Beri, Anaemia, weak muscles; poor coordination; feels tiredness and weakness.	Found in milk, egg, sprouted grains, whole cereals, green leafy vegetables, peas, beans, etc.
Vitamin-C (Ascorbic Acid)	Water Soluble Vitamin	Maintenance of ligaments, tendons, blood vessels, capillary walls and delicate lining of mouth and gums.	Pyorrhea, Scurvy, uncontrolled bleeding, delayed blood clotting	Found in citrus fruits like lemon, orange, amla, tomatoes, fresh vegetables, etc.

(B) MINERALS

Minerals contain certain elements required by our body. They are needed in small quantities but they are very essential for proper growth and development of body. Their deficiency causes certain diseases. They are supplied in the form of salts by various food items. The important macro minerals required by our body are Sodium, Chloride, Potassium, Calcium, Phosphorus, Magnesium and Sulphur. The important micro-minerals are Iodine, Iron, Zinc, Fluoride, Copper etc.

Minerals Food



Non-Nutritive Component of Diet
(Mineral : Required for; Mineral Deficiency Diseases and main Sources)

Mineral	Component	Required for	Deficiency Diseases	Main Sources
alcium	Macro Mineral	Bones and teeth formation	Rickets, Osteoporosis, retarded growth, less height, delayed recovery from bone injury.	Found in dairy products, fruits, tomatoes, vegetables, etc.
otassium	Macro Mineral	Nervous & Muscular system (Neuro-muscular System), maintain hydro balance in body.	Hypokalemia; slow responses and lethargic,	Found in banana, sweet potato, mushroom, apricot, grapefruit, orange, dry fruits, etc.
Phosphorous	Macro Mineral	Strong bones and teeth	Osteoporosis easily bone injury.	Found in meats, poultry, fish, nuts, beans and dairy products.
Sodium	Macro Mineral	Improve Neuro-muscular system	Cramps slow responses and lethargic	Found in common salt, fruits, vegetables etc
Sulphur	Macro Mineral	Helps in protein and insulin synthesis, acts as antibacterial.	Skin allergy, Skin Infection, Dandruff.	Found in garlic, onion, meat, egg, walnuts etc.
Chloride	Macro Mineral	Prevent against infection, good functioning of skin	Dehydration, fluid loss, vomiting, diarrhoea	Found in tomato, sea weed, salt, egg, etc
Iron	Micro / Trace Mineral	Formation of Haemoglobin by which RBC's quality improves, metabolism processes, more oxygen caring capacity of blood.	Anaemia, weakness, get easily tired, breathlessness at low oxygen.	Found in green leafy vegetables, spinach, egg, meat, etc.
Iodine	Micro / Trace Mineral	Improves metabolism process, helps energy production, hormone production.	Goitre, slows brain development, hormonal variation.	Found in sea food, sea fishes, iodized salt, etc.
Fluoride	Micro / Trace Mineral	Improves bone and teeth growth, prevent decay by bacteria.	Cavities in teeth, toothdecay, weak bones, bone infection.	Found in fruits, dry fruits, grapes, apple, potato, coffee, onion, etc.
Zinc	Micro / Trace Mineral	Helps in protein synthesis, improves wound healing, Sperm growth	Impotency in male	Found in dairy products, meat, egg, whole grains, cereals, etc.

Copper	Micro / Trace Mineral	Enzymes production, Iron metabolism	Retarded growth	Found in sea food, whole grains, cereals etc.
Manganese	Micro / Trace Mineral	Enzymes production, energy metabolism	Retarded growth, slow responses	Found in sea food, whole grains, cereals etc.

(C) WATER

Our body consists of approximately 70 percent of water in body weight. An adult needs 3 to 5 litres of water daily for normal life. In summers, body needs more water due to sweating etc. The person who plays more or does hard physical activities also needs more water. Fruits, vegetables, beverages, milk etc. are good sources to provide water in our body. The water which we drink or consume should be safe, clean and hygienic.

If the water in body is reduced, it causes serious health problems like :

(*a*) **Loss of 1 to 5 percent of water results thirst;**

(*b*) **Loss of 5 to 10 percent of water results loss of strength and endurance;**

(*c*) **Loss of 10 to 15 percent of water results Dehydration, Lethargy, Body Ache, Pain;**

(*d*) **Loss of 15 to 20 percent of water results Blurred vision, Loss of memory, Faint;**

(*e*) **Loss of more than 20 percent of water results Death.**

IMPORTANCE OF WATER :

Water plays an important role in our body. Its importance are :

(*i*) **Regulates Body Temperature :** Water helps to maintain and regulate the body temperature by sweating, etc.

(*ii*) **Transportation of Nutrients :** Water in body helps to transport important nutrients through blood. Water in body also acts as solvent for carrying important nutrients.

(*iii*) **Maintains Body Fluids :** Water helps to maintain body fluids. It helps in digestion, absorption, circulation, creation of saliva etc.

(*iv*) **Eliminates Body Toxins :** It helps to eliminate body toxins and body wastes through excretion of urine and sweating etc.

(*v*) **Lubrication of Joints :** It helps in lubrication of joints, thus improves flexibility and joints mobility.

(*vi*) **Improves Skin Quality :** Sufficient water in body helps to keep the skin looking good and beautiful.

(*vii*) **Kidney Function Improves :** Water helps to clean kidneys and thus their function improves.

(*viii*) **Maintains Electrolyte Balance :** It helps to maintain electrolyte balance in body, thus impulses travel faster; moreover, faster responses.

(*ix*) **Boosts Physical Performance :** Sufficient water helps to boost physical performance whereas loss of water reduces performance.

(*x*) **Improves Digestion :** Water helps to improve digestion and absorption; moreover, prevents constipation.

(D) ROUGHAGE OR FIBER

Roughage, also known as 'Fiber' is indigestible portion of food. Fiber comes from the part of plant-based food that our body cannot digest. It is an essential dietary component that aids in digestion, prevents constipation and helps to manage cholesterol level. Most of the vegetables and fruits contain high fibers along with nutritional value. Legumes, nuts, grains, seeds also contain fibrous food.

4.(A) EATING FOR WEIGHT CONTROL (A HEALTHY WEIGHT)

A stable weight depends on a balance between the energy you get from food and the energy you use. When a person consumes more calories than the energy they use, the body stores the extra calories in fat cells (lipocytes). When a person burns up more calories than they consume, they will lose weight. Fat cells grow or shrink depending on how people use energy.

A stable weight depends on a balance between the energy you get from food and the energy you use. You use energy during the day in three ways : Energy expended during rest (basal metabolism). Energy used to break down food (thermogenesis). Energy gets used during physical activity and exercising, moreover extra fat burn up. This leads to weight gain.

BMI (Body Mass Index) or Quetelet's Index helps to know whether a person is underweight, normal weight or overweight, thus accordingly diet and workout can be allotted/prescribed to gain or to reduce weight. Here height is considered in metres and centimetres; weight is considered in kilograms and grams. BMI is calculated by taking person's weight (in kg and gm) and dividing by height (mt and cm) square, i.e.

$$\text{Weight} \div (\text{height} \times \text{height}).$$

Example : If your height is 1.82 m, the divisor of the calculation will be (1.82 × 1.82) = 3.3124. If your weight is 70.5 kg then your BMI is 21.3 (70.5 ÷ 3.3124). Higher the figure, the more overweight is the person. This is just a guide to know overweight content in body. This test can be a preventive step towards obesity.

Category	Men	Women
Underweight Range	Less than 20	Less than 19
Healthy Range	20 to 25	19 to 24
Overweight Range	26 to 30	25 to 30
Obese Range	More than 30	More than 30

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Tips for Weight Control

(i) Balanced Diet : Overweight or obese persons should strictly take balanced diet with very less amount of carbohydrates and fats.

(ii) Eating lot of Fibrous Food : Food items like fruits, salad, vegetables, etc., are rich sources of fibers. Foods with high fiber content provide vitamins and minerals to the body. They are low in energy food and thus prevent obesity.

(iii) Avoid Fats : Avoid taking fats, trans-fat food items, fried foods like butter, cream, ghee, animal fats, etc. For the sake of taste, only refined oil or mustard oil should be used for cooking.

(iv) Physical Activity : Overweight or obese persons should perform physical activity regularly and avoid sedentary lifestyle.

(v) Avoid Junk Food : Avoid junk food or trans food items which have high calories, moreover, it causes many health problems. The food items like burger, pastry, chocolates, namkeen, chips, cold drinks, candy, etc., should be avoided.

(vi) Drink Water : Drink lots of water, it prevents acidity and reduces the stress over kidney and stomach; moreover, it helps in cleaning the body waste.

(vii) Avoid Spicy Food : Spicy food causes many health problems (diseases, illnesses and disorder of body), so it should be avoided.

(viii) Regular Medical Check-up : We should regularly go for medical checkup (every 6 months). Moreover, BMI should be done once in a month.

(ix) Medicine only by Doctor's Advice : Overweight or obese persons should consult an expert doctor and follow his advice or prescription in case of health problems (disease, illness, weakness, etc.).

(x) Avoid Pitfall : Pitfall of dieting should be avoided as it affects the health of an individual.

(xi) Avoid Intake of Alcohol (Drugs) : Obese persons should strictly avoid drinking (alcohol), smoking and chewing of tobacco.

(xii) Meals in Small Shifts : The diet should be taken in small shifts after some intervals rather than big heavy meals.

(xiii) Follow Hygienic Habits : We should always follow hygienic habits while eating like, cleaning of fruits and vegetables thoroughly; eating fresh food; chewing the food thoroughly; maintaining good posture while eating, washing the hands and utensils before using; cleaning the place around eatables, etc.

(xiv) Do not Fast too Long : Sometimes people do not eat to reduce weight and fast long. This leads to serious problems like tinting, convulsions (pain) in stomach, headache, vomiting, etc.

(xv) Never Try Slimming Pills : These are low graded medicines and they are poison to the body. The effects of these can be very harmful to the body. So we should never try any form of slimming pills, medicines/drugs, etc. for reducing weight.

(xvi) Avoid Over-Eating : Person should avoid overeating, breakfast to be heavy whereas dinner should be light.

4.(B) PITFALL OF DIETING

Pitfall of dieting is extreme reducing of energy food. Low calorie intake or starving to reduce weight is Pitfall of Dieting. Pitfall of dieting causes serious health problems. Every individual wants to look attractive, slim and trim. An individual who is overweight wants to reduce weight by starving, low calorie diet, skipping the meals to reduce their weight.

PITFALL CAUSES AND THEIR EFFECTS :

(i) Extreme Reduction of Calories : Person reduces the diet considerably which causes low level of energy, thus person feels lethargic, tiredness, body ache, etc.

(ii) Skipping Meals : People often skip meals to reduce weight whereas in next meal they take large amount of food.

(iii) Low Energy Diet : The persons take diet without fats and less carbohydrates by which health is affected.

(iv) Not Performing Physical Activity : People often consider that reducing diet is good for controlling weight; thus they neglect physical activity, which is equally important for healthy lifestyle.

(v) Taking Less Liquid : People often think that drinking water or liquid makes them to gain weight which is wrong.

(vi) Starving : Starving causes serious health problem and it is dangerous. Thus, starving should not be done for longer period.

(vii) Risk of Obesity : Many people believe that if they eat good diet they will gain weight, thus, become obese.

(viii) Stress : Many people feel stress that they are overweight, thus go for pitfall.

(ix) Slim Look : Some people think that they will look attractive if they are slim, thus go for pitfall of dieting.

(x) Slimming Pills : Sometimes people take slimming pills to reduce weight without consultation with Doctor; it may be fatal.

4.(C) FOOD INTOLERANCE

It is that when a person has difficulty in digesting a particular food. In simple words, food intolerance means when an individual cannot digest certain food properly due to food hypersensitivity. Food intolerance is often confused with food allergy, however, both are different. Food intolerance leads to problem of digestion whereas food allergy is related with immune system.

Causes : Absence of activity of enzymes responsible for breaking down the food elements. It may be due to hypersensitivity to certain food items. These are usually innate sometimes diet related or due to illness. This problem arises when a person consumes large amount of specific food whereas less amount of same food can be tolerated and digested.

Symptoms : Shows the symptoms like **vomiting, nausea, pain in joints, headache, rashes on skin etc.**

Management : The person should meet expert Doctor for his food intolerance and follow the instructions as given by Doctor or Dietician. This can be prevented by avoiding those certain food products and intake of yogurt products, consuming alternate food products, etc.

4.(D) FOOD MYTHS

Dieting myths are wrong concepts about food. It does not have any scientific justification, thus they are misconcepts.

(i) Myth : Low fat or no-fat diet is good for you.

Fact : Leading dieticians believe that low fat diet losses weight but there is no need to follow fat-free diet. Cutting down on saturated fats and eating unsaturated fats will help. Body needs fats for energy, tissue repair and to transport vitamins A, D, E and K in body.

(ii) Myth : The fewer the carbohydrates, healthier you are.

Fact : Choosing the healthiest carbohydrates, especially whole grains, is important for health and well-being. Refined carbohydrates should be avoided, however, choosing whole grains is associated with a decreased risk of chronic diseases and premature mortality.

(iii) Myth : Crash dieting or fasting makes you lose weight.

Fact : This may be true in short term but ultimately it can hinder weight loss. Losing weight over the long term burns off fats whereas crash dieting or fasting, not only removes fat but also leans muscles or tissues. Thus, body gains lot of fats (more than lost by fasting) when taken in diet. Thus, exercises are recommended for weight loss plan.

(iv) Myth : Oils/Margarine have fewer calories than Ghee/butter.

Fact : Ghee/Butter and Oils/Margarine have about the same amount of calories. Margarine, which is made from vegetable oils, was seen as a healthier alternative to butter (which contains cholesterol and saturated fat), but later it was found that some margarines are actually unhealthier because they contain trans fats, which have even more adverse effects on cholesterol and heart health.

(v) Myth : Apples and brinjals are rich in iron because they turn brown when cut.

Fact : One of the greatest myths about apples and brinjals is that they are good sources of iron. These are excellent source of fiber but not iron. This change in colour is an enzymatic reaction and has nothing to do with iron.

(vi) Myth : Food eaten late night is more fattening.

Fact : Studies revealed that large meals eaten late night did not make much change, i.e. to store more fat. It is also revealed that people who skip meals during day, eat lot in evening and more likely to gain weight than those who eat regularly throughout the day.

(vii) Myth : Slow metabolism prevents weight loss.

Fact : Studies prove that resting metabolism is directly related to the body weight whereas metabolism rate increases with high physical activity.

(viii) Myth : Low fat milk has less calcium than full fat milk.

Fact : Skimmed and semi-skimmed milk actually have more calcium because calcium is in watery part and not in creamy part of milk.

(ix) Myth : Vegetarian cannot build muscles.

Fact : Vegetarians can be as muscular as meat eaters by getting their proteins from vegetables sources such as cheese, nuts, pulses and grains. Excess of proteins causes overload of kidney and may cause health problems.

(x) Myth : Healthy food is expensive.

Fact : Tinned, stored, packed or off seasonal food is expensive whereas local and seasonal food is inexpensive and cheap and easily available; moreover, it is more nutritious.

(xi) Myth : Only overweight persons need exercise.

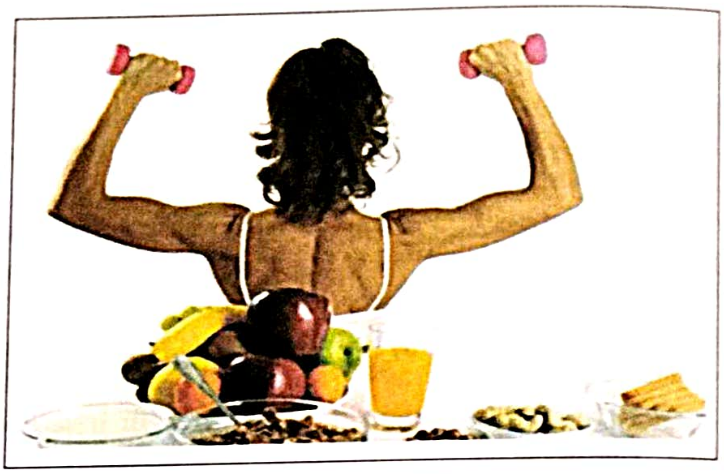
Fact : Many people think that exercise helps to lose weight and they do not need to lose weight whereas exercises help to keep us healthy (physically and mentally); moreover, it manages stresses of life and develops socialization.

(xii) Myth : Eggs increase cholesterol level so avoid them.

Fact : There is no doubt that eggs are good source of various important nutrients. Even some amount of cholesterol is also required by the body. So if we take eggs, there is no ill effect on health.

5. IMPORTANCE OF DIET IN SPORTS

Diet plays an important role in sports performance. As there are lot of activities in games and sports, thus individual requires specific diet to improve performance. In almost all sports activities, the diet during training period should be rich of complex carbohydrates along with low fat diet. This diet helps to provide sufficient energy during training period. **The diet one week before the competition should be rich of complex carbohydrates (like rice, wheat, bread, potatoes, cereals, milk, cakes, etc.). This raises the glycogen stores of energy in the body. Vitamins and minerals should also be maintained during this period.**


Sports Food Items

The meal before the competition should be taken at least 3 to 4 hours before the competition. This diet should be rich of complex carbohydrates, low in fat, low in protein and low in fibres like milk, cereals, rice, wheat, bread, cake, potatoes, chocolates, etc.

The diet during the competition should consist of simple carbohydrates if required (in prolonged activity for more than 1 hour intensive workout). It should be more in liquid form rather than in hard stuffy form. It helps to maintain water balance of the body along with sufficient quick energy source like fruits, fruit juices, banana, etc.

In contact sports (Wrestling, Judo, Kabaddi, Karate), there are lot of injuries during training period. Thus, their diet has more amounts of proteins to repair and replace the worn out tissues. These players are also advised to take lot of complex carbohydrates along with vitamins and minerals.

In explosive activities like throws, jumps, weightlifting, etc. the player should take lot of vitamins, minerals, whereas raised amount of proteins is also advised.

SPORTS DIET

Sports Activity	Diet Before Competition (up to 4 hours before competition)	Diet During Competition	Diet After Competition
Endurance activities like players of Marathon, Basketball, Football, Hockey, Cycling.	More amount of complex carbohydrates like Rice, Potato, Wheat, Bread. It increases glycogen store (helpful for aerobic energy) Low level of fat and proteins.	Simple carbohydrates like energy bars, banana, fruits etc. in small proportion during breaks/ time outs / intervals. Sufficient water should also be taken during breaks / timeouts / intervals like water, lemon water, fruit juice, energy drinks, etc.	Sufficient amounts of complex carbohydrates, some amount of low fats and proteins. Sufficient water should be drunk. Rice, potato, wheat, bread, chocolate, cake, biscuits pulses, cereals, etc. are sources of complex carbohydrates.
Skill activities or Speed activities like players of Sprint races, Middle distance races, Kho-Kho, Water-polo, Skating, Swimming.	More amount of complex carbohydrates.	Simple carbohydrates like energy bars, banana, fruits etc. in small proportion during breaks/ time outs / intervals. Sufficient water should also be taken during breaks / timeouts / intervals like water, lemon water, fruit juice, energy drinks, etc.	Sufficient amount of complex carbohydrates, lots of vitamins and minerals, increased amount of proteins. Moreover, sufficient water intake should be taken.

Sports Activity	Diet Before Competition (up to 4 hours before competition)	Diet During Competition	Diet After Competition
Explosive activities and body contact activities like players of Wrestling, Kabaddi, Judo, Jump, Throws.	More amount of carbohydrates–simple and complex.	Simple carbohydrates like energy bars, banana, fruits etc. in small proportion during breaks/ time outs / intervals. Sufficient water should also be taken during breaks / timeouts / intervals like water, lemon water, fruit juice, energy drinks, etc.	Sufficient amount of complex carbohydrates, and proteins, lots of vitamins and minerals. Moreover, sufficient water intake should be taken.

ENERGY REQUIREMENT OF INDIVIDUAL

The daily energy requirement of an individual is evaluated by adding the Basal Energy Requirement (BER) and Extra Energy Requirement (EER). The energy value is measured in heat unit called Calorie or kilocalorie. One calorie raises the temperature to one degree of one gram. A kilocalorie is written as k Cal, Calorie with capital C.

The Basal Energy Requirement (BER) is calculated by multiplying the body weight (in kg) by 24 hours (one day) with 1.3 Cal. As 1.3 Calorie is required per kilogram, per hour of BER, i.e.

1.3 Cal × body weight (in kg) × 24 hour = Basal Energy Requirement (BER).

If a person is with body weight 60 kg then Basal Energy Requirement (BER) is

1.3 Cal × 60 kg × 24 hr = 1872 Cal per day.

The Extra Energy Requirement (EER) is calculated by multiplying the body weight (in kg) by hours of training with 8.5 Cal. As 8.5 Cal is required per kilogram per hour of EER. If a person is with body weight 60 kg and performs 2 hours training then Extra Energy Requirement (EER) is 8.5 Cal × 60 kg × 2 hr = 1020 Cal for two hour training. Thus, Total Energy Requirement of a person with 60 kg body weight with 2 hour training workout in a day is adding Basal Energy Requirement with Extra Energy Requirement.

BER (1872 Cal) + EER (1020 Cal) = 2892 Cal.

Approximate Calorie Requirement of Various Groups

Group	Calories Per Day
Child of 2 years requires	800 Calories per day approximately
Child of 10 years requires	1500 Calories per day approximately
Child of 14 years requires	1800 Calories per day approximately
Adult female (50 kg) requires	2400 Calories per day approximately
Adult male (60 kg) requires	2800 Calories per day approximately
Adult male with heavy sports activity requires	3500 Calories per day approximately
Adult male with very hard physical activity requires	5000 Calories per day approximately

UNIT 6

TEST AND MEASUREMENT IN SPORTS

TOPICS & LEARNING OUTCOMES

1. **Fitness Test – SAI Khelo India Fitness Test in school:**
   Age group 5-8 yrs/ class 1-3: BMI, Flamingo Balance Test, Plate Tapping Test
   Age group 9-18yrs/ class 4-12: BMI, 50mt Speed test, 600mt Run/Walk, Sit & Reach flexibility test, Strength Test (Partial Abdominal Curl Up, Push-Ups for boys, Modified Push-Ups for girls):
   In this topic we will understand how to Conduct, Check and Evaluate various fitness components of school going students.
2. **Measurement of Cardio-Vascular Fitness – Harvard Step Test – Duration of the Exercise in Seconds ×100/5.5 × Pulse count of 1–1.5 Min after Exercise.**
   To make students to determine physical fitness through Harvard Step Test/Rock port test.
3. **Computing Basal Metabolic Rate (BMR): This topic will help how to Compute and Evaluate BMR**
4. **Rikli & Jones - Senior Citizen Fitness Test**
   - **I. Chair Stand Test for lower body strength**
   - **II. Arm Curl Test for upper body strength**
   - **III. Chair Sit & Reach Test for lower body flexibility**
   - **IV. Back Scratch Test for upper body flexibility**
   - **V. Eight Foot Up & Go Test for agility**
   - **VI. Six Minute Walk Test for Aerobic Endurance**

   In this test we will understand how to Conduct, Check and Evaluate various fitness components of Senior Citizen.
5. **Johnson – Metheny Test of Motor Educability (Front Roll, Roll, Jumping Half-Turn, Jumping Full-Turn.**

INTRODUCTION

The task or work needs to be evaluated. Evaluation is based upon the test and measurement we conducted.

"In scientific terms 'test' is an instrument or tool used to obtain data on specific traits/characteristics of an individual or group". A good test should measure the quality for which it is to be used. It should be simple, accurate and easy to administer. "Measurement" it is an aid to evaluate, it consists of numerical values or scientific scores by expert and also known as raw score. "Evaluation" in test and measurement are the prerequisites for evaluation. The evaluation tells the worth or progress of the individual or group. It is basically a subjective judgement based upon interpretation or analysis of data/scores gained from the test.

Test and measurement are very important for the progress of an individual. Test and measurement also play an important role to evaluate the activities of physical education, especially physical fitness components, motor fitness and skill ability in sports. There are various types of test in physical education. The common tests are : Motor Fitness Test (SAI Khelo India Fitness Test, Aapher Test, Kraus Weber Test, Barrow Test for General Motor Fitness; Harvard Step Test for measuring Cardiovascular Fitness; Rikli and Jones Test for measuring the fitness of senior citizen etc. A good test helps to collect data or score which can be evaluated for further improvement.

1. FITNESS TEST- SAI KHELO INDIA FITNESS TEST IN SCHOOL

SAI Khelo India Fitness Test Battery has been designed to check the fundamental (important) Motor Fitness Components for school going students. This test battery has many test items which helps to evaluate the fundamental components of Motor Physical Fitness. This test is made for two age groups.

(A) Age group 5 to 8 years (1st to 3rd class students): It consists of three test items

(*i*) BMI test for body composition,

(*ii*) Flamingo Test for Balance

(*iii*) Plate Tapping Test for Speed and Limb Agility / Coordinative ability.

(B) Age group 9 to 18 years (4th to 12th class students): It consists of six test items

(*i*) BMI test for Body Composition,

(*ii*) 50 meters Sprint for Speed and Acceleration

(*iii*) 600 meters Run or Walk for Cardio-vascular Endurance

(*iv*) Sit and Reach Test for Flexibility of Lower Back

(*v*) Abdominal Partial Curl- up Test for Abdominal Strength

(*vi*) Push-ups (Boys) / Modified Push-ups (Girls) for Upper Body Strength

(I) BODY MASS INDEX TEST (BMI) : (FOR JUNIOR AND SENIOR (5 TO 18 YEARS) AGE GROUP)

BMI stands for Body Mass Index. This fitness testing is used to measure body composition on the basis of weight and height. This formula and index was formulated by Belgian mathematician and statistician Adolphe Quetelet. BMI helps a person to know whether he is underweight, normal or overweight. By knowing the body type, accordingly diet and workout can be set to gain or to reduce weight.

Purpose : To measure Body Composition

Objective : To measure the Height and Weight and evaluate the Body Composition and General Health of the individual after computing.

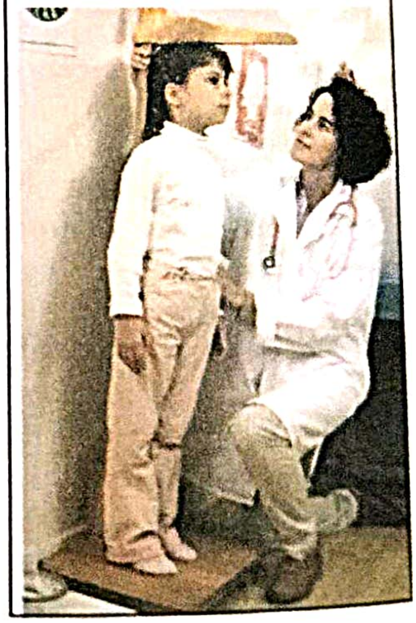
Infrastructure/Equipment Required: Flat, Clean surface, Weighing Machine, Stadiometer/Measuring Tape pasted on a wall.

Test Administration :

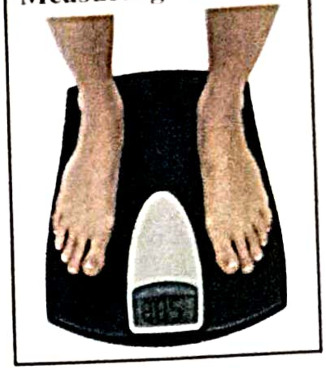
(*i*) Remove the participant's shoes, bulky clothing, and hair ornaments, and unbraid hair that interferes with the measurement.

(*ii*) Height Measurement : Take the height measurement on flooring against a flat surface such as a wall with no molding. Have the participant stand with feet flat, together, and back against the wall. Make sure legs are straight, arms are at sides, and shoulders are level. Make sure the participant is looking straight ahead and that the line of sight is parallel with the floor. Take the measurement while the participant stands with head, shoulders, buttocks, and heels touching the flat surface (wall). Use a metal tape to measure from the base on the floor to the marked measurement on the wall to get the height measurement. Accurately record the height to the nearest 0.1 centimeter.

Height Measurement



Measuring Weight



(iii) **Measuring Weight :** Use a Digital Weighing Scale to measure the weight of the participant. (Avoid using bathroom scales that are spring loaded). Place the scale on firm flooring (such as tile or wood) rather than carpet. Have the participant remove shoes and heavy clothing, such as sweaters. Have the participant stand with both feet in the center of the scale. Record the weight to the nearest decimal fraction (for example, 28.1 kilograms).

(iv) **Computing the Height and Weight :** Here, height is considered in metres and centimetres; weight is considered in kilograms and grams.

(v) BMI can be calculated by taking person's weight (in kg and gm) and dividing it by height (mt and cm) square, *i.e.*, **BMI = Weight ÷ (Height × Height)**

Example : For instance, if your height is 1.82 m, the square of height will be (1.82 × 1.82) = 3.3124. If your weight is 70.5 kg then your BMI = 70.5 ÷ 3.31 = 21.3.

Evaluation of Test : Higher the figure, the more overweight is the person. This is just a guide to know overweight content in the body. This test can be a preventive step towards obesity.

Scoring : Use table to determine your BMI rating.

Category	Men	Women
Underweight Range	Less than 20	Less than 19
Healthy Range	20 to 25	19 to 24
Overweight Range	26 to 30	25 to 30
Obese Range	More than 30	More than 30

(II) PLATE TAPPING TEST (FOR JUNIOR 5-8 YEARS AGE GROUP)

Purpose : Plate Tapping Test helps to measure the Speed and Coordination/ Agility of Limb Movement

Objective : To do the tapping over the plate as fast as possible.

Infrastructure/Equipment Required: Table (adjustable height), 2 yellow discs (20cm diameter), rectangle (30 × 20 cm), stopwatch

Test Administration :

(i) If possible, the table height should be adjusted so that the subject is standing comfortably in front of the discs.

(ii) The two yellow discs are placed with their centers 60 cm apart on the table. The rectangle is placed equidistant between both discs. The non-preferred hand is placed on the rectangle.

(iii) The subject moves the preferred hand back and forth between the discs over the hand in the middle as quickly as possible.

(iv) This action is repeated for 25 full cycles (50 taps).

Administrative Suggestion: Participants should be encouraged to stand in a balanced posture, feet apart to shoulder width. Results are usually better if the participant can maintain constant pace during most of the run.

Plate Tapping Test

Scoring: The time taken to complete 25 cycles is recorded.

Evaluation : Evaluation can be compared. Teacher can also create own norms for evaluation, like this

	Excellent	Good	Average	Fair	Poor	Bad
Boys Tapping (No)	50+	49 to 40	39 to 30	29 to 20	19 to 10	10 below
Girls Tapping (No)	50+	49 to 40	39 to 30	29 to 20	19 to 10	10 below

(III) FLAMINGO TEST (FOR JUNIOR 5-8 YEARS AGE GROUP)

Purpose : To check the Balance and Strength ability of the individual on the single leg.

Objective : To balance on a given box/block/brick in given time on one leg.

Infrastructure/Equipment Required: Non slippery even surface, Stopwatch, can be done on just standing on beam.

Test Administration :

(*i*) Stand on the beam. Keep balance by holding the instructor's hand (if required to start).

(*ii*) While balancing on the preferred leg, the free leg is flexed at the knee and the foot of this leg held close to the buttocks.

(*iii*) Start the watch as the instructor lets go of the participant/subject.

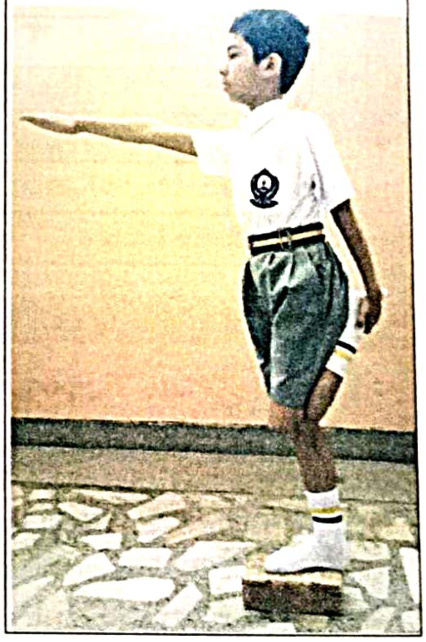
(*iv*) Pause the stopwatch each time the subject loses balance (either by falling off the beam or letting goes of the foot being held).

(*v*) Resume over, again timing until they lose balance. Count the number of falls in 60 seconds of balancing. If there are more than 15 falls in the first 30 seconds, the test is terminated.

Administrative Suggestion: Participants should be encouraged to eyes focused on stationary object straight ahead.

Scoring: The total number of falls or loss of balance in 60 seconds of balancing is recorded. If there are more than 15 falls in the first 30 seconds, the test is terminated. Teacher can also create own norms for evaluation like this :

Flamingo Test



	Excellent	Good	Average	Fair	Poor	Bad
Boys Falls in 60 seconds (No)	No fall	1 to 2 falls	3 to 5 falls	6 to 9 falls	10 to 12 falls	13 above
Girls Falls in 60 seconds (No)	No fall	1 to 2 falls	3 to 5 falls	6 to 9 falls	10 to 12 falls	13 above

(IV) 50 M SPRINT TEST (STANDING START) (FOR 9 TO 18 YEARS AGE GROUP)

Purpose : To measure the Speed and Acceleration.

Objective : To cover the set distance as fast as possible.

Infrastructure/Equipment Requirement : Measuring tape or marked track or flat surface of at least 70 meters, stopwatch.

Test Administration : (*i*) After warm-up the participant stand behind the starting line in stationary position.

(*ii*) At the blow of whistle or "Go" the participant sprint or run fast up to finish line which is 50 meter away from starting line.

(*iii*) Time is recorded up to finish line in seconds and milli seconds.

Scoring : The best time is recorded to the nearest 2 decimal places. The timing starts from the first movement (using a stopwatch) and finishes when the chest crosses the finish line.

Evaluation : Timings for evaluation can be compared. Teacher can also create own norms for evaluation. like this for average sprint running timing :

	Excellent	Good	Average	Fair	Poor	Bad
Boys Timing (sec. & milli sec.)	6.5(sec.)	7.5(sec.)	8.5(sec.)	9:5(sec.)	10:5(sec.)	11:5(sec.)
Girls Timing (sec. & milli sec.)	8.0(sec.)	9.0(sec.)	10:0(sec.)	11:0(sec.)	12:0(sec.)	13:0(sec.)

(V) 600 M RUN OR WALK TEST (FOR 9 TO 18 YEARS AGE GROUP)

Purpose : **To measure Cardiovascular Endurance.**

Objective : To cover the set distance as fast as possible.

Infrastructure/Equipment Required : Oval or running track, marking cones, recording sheets, stopwatch.

Test Administration : In this student has to run or walk covering 600 meters in shortest time.

Scoring : Time is noted in minutes and seconds as a score.

Evaluation : Timings for evaluation can be compared. Teacher can also create own norms for evaluation. Like this for average running timing.

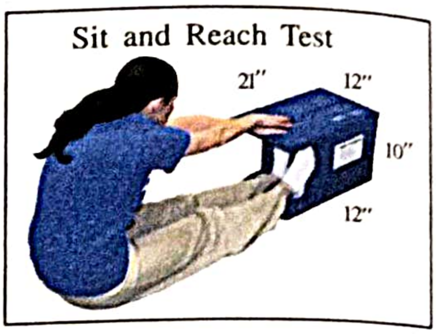
	Excellent	Good	Average	Fair	Poor	Bad
Boys Timing (min & sec.)	1:45 m/s	2:00 m/s	2:15 m/s	2:30 m/s	2:45 m/s	3:00 m/s
Girls Timing (min & sec.)	2:00 m/s	2:15 m/s	2:30 m/s	2:45 m/s	3:00 m/s	3:15 m/s

(VI) SIT AND REACH TEST (FOR 9 TO 18 YEARS AGE GROUP)

Purpose : **To measure the Flexibility of Lower Back.**

Objective : To stretch trunk forward as far as possible.

Infrastructure/Equipments Required : Sit and Reach box or wooden box with ruler / length scale in centimeter on top. Box dimensions are : Sides of box 12″ × 12″ (in inches); Front and back of box 12″ × 10″ (in inches); Top of box 12″ × 21″ (in inches).



Test Administration : (*i*) After warming-up this test is performed.

(*ii*) This test involves sitting on the floor with legs stretched out straight ahead.

(*iii*) The soles of the feet are placed flat against the box whereas both knees should be locked and pressed flat to the floor (assistant may hold them down).

(*iv*) Now stretch both hands forward and reaches towards the box whereas hands together to reach maximum towards box measuring tape.

(*v*) Hold the position for two seconds at top penal of box and measure the distance in centimeters by ruler or length scale. Ensure that no jerky action or quick movement is done during test.

Scoring : The score is recorded to the nearest centimeter that is the distance between the initial position and final position. If hand touches the toe then the score is zero. If it crosses beyond toe level then score is positive. If it does not reach at toe level then the score is negative.

Evaluation : Evaluation can be compared. Teacher can also create own norms for evaluation like this for average.

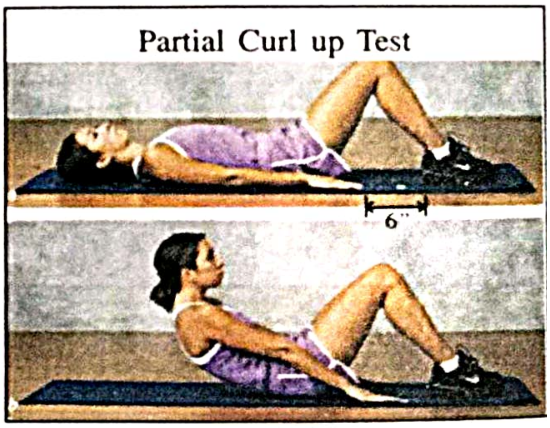
	Excellent	Good	Average	Fair	Poor	Bad
Boys Sit and Reach (Centimeters)	+20 cm	+15 cm	+10 cm	0 cm	–10 cm	–15 cm
Girls Sit and Reach (Centimeters)	+20 cm	+15 cm	+10 cm	0 cm	–10 cm	–15 cm

(VII) PARTIAL CURL-UP TEST (FOR 9 TO 18 YEARS AGE GROUP)

Purpose : To test Abdominal Strength and Endurance.

Objective : To perform partial curl-ups as many as possible in the given time (30 sec.).

Infrastructure/Equipments Required : A flat, clean, cushioned surface or gym mat, recording sheets, pen, and a metronome (or audio tape, drums).



Test Administration : (*i*) The participant lies on cushioned, flat, clean surface with knees bent at about 90 degree, arms are placed at the sides with palm facing downward.

(*ii*) The participant curls up keeping the hands on the floor and then returns to the original position.

(*iii*) Hands should cross the marked line 6 inches away from starting point.

Administrative Suggestion : Breathing and pace of doing the activity should be constant.

Scoring : The score is the maximum number of correct Partial Curl up in 30 second duration.

Evaluation : Evaluation can be compared. Teacher can also create own norms for evaluation like this

	Excellent	Good	Average	Fair	Poor	Bad
Boys Partial Curl-ups (No.)	25	20	15	10	5	0
Girls Partial Curl-ups (No.)	20	15	10	5	3	0

(VIII) PUSH-UPS (BOYS) MODIFIED PUSH-UPS (GIRLS) TEST (FOR 9 TO 18 YEARS AGE GROUP)

Purpose : **To test and measures Upper Body Strength and Endurance.**

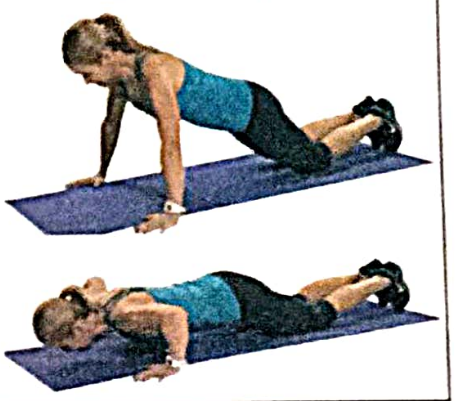
Objective : To perform Push-ups (Boys), Modified Push-ups (Girls) as many as possible in the given time (30 sec.).

Push-up (Boys)

Infrastructure/Equipments Required : A flat, clean, cushioned surface or floor mat, recording sheets, pen.

Test Administration : (*i*) After warming-up this test is performed. (*ii*) A standard push-up for boys begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width a-part, on the floor. (*iii*) The subject lowers the body so that chest should touch floor, or until there is a 90-degree angle at the elbows. (*iv*) Then returns back to the starting position with the arms extended. (*v*) In modified Push-up for girls, the knees touch the floor. (*vi*) This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.

Modified Push-up (Girls)



Administrative Suggestion : Breathing and pace of doing the activity should be constant.

Scoring : Record the total number of correctly completed push-up.

Evaluation : Evaluation can be compared. Teacher can also create own norms for evaluation.

Like this

	Excellent	Good	Average	Fair	Poor	Bad
Boys Push-ups (No)	50	40	30	20	10	0
Girls Push-ups (No)	40	30	20	10	5	0

2. MEASUREMENT OF CARDIO-VASCULAR FITNESS (HARVARD STEP TEST)

Harvard step test was developed by Brouha in 1943 for the purpose of measuring physical fitness for work and the ability to recover from work and to measure the cardiovascular fitness of the individual. It is good test for measurement of fitness and ability to recover after strenuous exercise.

Purpose : **To measure the Aerobic fitness (Cardiovascular Endurance) of an individual.**

Objective : To perform step test continuously without break for 5 minutes or until exhausted.

Equipments and Requirements of Test : Gym Bench or Box height (45 cm / 17 inches high for women and 50 cm / 20 inches for men), Stopwatch, Assistant / Helper.

Procedure of Test : In this test, the student step-up and step-down on to the gym bench for 5 minutes or until exhaustion at a rate of 30 steps per minute.

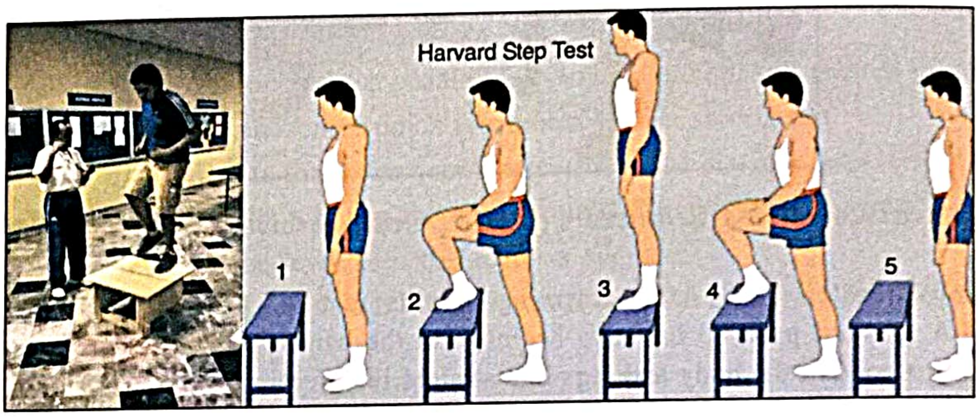
(i) Firstly, the student performs warm-up and comes near the Gym Bench.

(ii) At the command of 'GO' the student starts to step-up and step-down on to the Gym Bench whereas assistant starts the stopwatch at same time.

(iii) This goes on (step-up and step-down) for five minutes or until exhaustion.

(iv) After completion of the test student sits down and tester takes the heart beats between 1 to 1½ minutes.

Calculation Procedure : $$\frac{\text{Duration of Exercise (in Seconds)} \times 100}{5.5 \times \text{Pulse count (between 1 to 1.5 minute after exercise)}}$$



Scoring and Evaluation :

	Excellent	Good	Average	Fair	Poor	Bad
Boys	Above 80	79-70	69-60	59-50	49-40	below 40
Girls	Above 75	74-65	64-55	54-45	44-35	below 35

3. COMPUTING, BASAL METABOLIC RATE (BMR)

BMR stands for Basal Metabolic Rate. It helps to calculate the number of Calories required by the individual while doing the basic level of activity. It is approximately 60% to 70% of the Calories requirement of the individual. The Harris-Benedict Equation is often used to estimate BMR. It is as

MEN : BMR = 88.362 + (13.397 × weight in kg) + (4.799 × height in cm) – (5.677×age in years)
WOMEN : BMR = 447.593 + (9.247 × weight in kg) + (3.098 × height in cm) – (4.330×age in years)

Example : Boy's with Weight 66kg; Height is 167cm and age is 19 years

Then BMR is = 88.362 + (13.397 × 66 kg) + (4.799 × 167cm) – (5.677 × 19 years)

= 88.362 + 884.202 + 801.433 - 107.863 = 1773.997 - 107.824 = **1495.824**

BMR, is influenced by a number of factors like age, weight, height, gender, environmental temperature, dieting, and exercise habits. The energy requirement Calories increases according to workout ability of the individual.

(a) Resting Metabolic Rate (RMR), which is the calories burned if you stayed in bed all day.

(b) If the person is having **Sedentary Life** with little or no exercise schedule then BMR is multiplied with 1.2 ; ie **BMR × 1.2.** (Sedentary life has 15 to 30 minutes workout once in a week)

(c) If the person is having **Light Active Life** with light exercise schedule of 1 to 3 days in a week; then BMR is multiplied with 1.375; *i.e.,* **BMR × 1.375.** (Light Active life has 15 to 30 minutes workout in a thrice in a week)

(*d*) If the person is having **Moderately Active Life** with moderate exercise schedule of 3 to 5 days in a week then BMR is multiplied with 1.55 ; *i.e.,* **BMR × 1.55.** (Moderately Active life has 30 to 60 minutes workout in a thrice in a week)

(*e*) If the person is having **High Active Life** with heavy exercise schedule of 6 to 7 days in a week then BMR is multiplied with 1.725; *i.e.,* **BMR × 1.725.** (High Active life has 60 to 90 minutes workout five days in a week)

(*f*) If the person is having **Very Hard/ High Active Life** with very heavy exercise schedule or job of 6 to 7 days in a week then BMR is multiplied with 1.9; *i.e.,* **BMR × 1.9.** (Very Hard/High Active Life has 120 to 180 minutes workout five days in a week)

4. RIKLI AND JONES TEST (FOR SENIOR CITIZEN FITNESS)

Senior citizen fitness test was **developed by Roberta Rikli and Dr. Jessie Jones for older people aged between 60 to 94 years.** It consists of six easy and simple tests that access the functional fitness of senior citizen. The tests are easy to conduct and it checks various motor fitness abilities in older people. The test has following items :

I. CHAIR STAND TEST

Purpose : To check the Lower Body.

Objective : To complete maximum stands in 30 seconds.

Infrastructure/Equipment Required : Equipments required are straight back chair without arms (approximately 45 cm high).

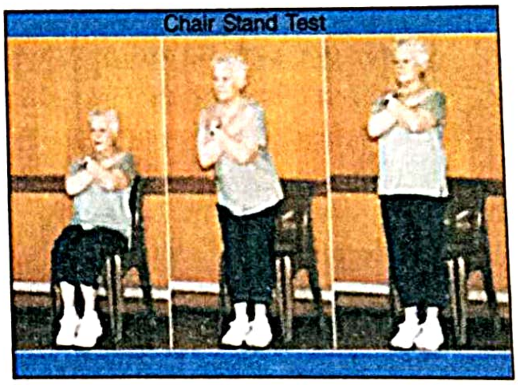
Test Administration :

(*i*) Place the chair against wall or stabilize it for safety.

(*ii*) The person sits on chair with feet apart (at shoulder width) on the floor. Arms crossed at the wrist and held close to chest.

(*iii*) From sitting position the person stands completely up and then completely back down.

(*iv*) It is repeated for 30 seconds.



Evaluation : The number of complete chair stand (up and down equals one stand) is score in 30 seconds.

Norms / Chart for reference is given.

Age in years (In No.)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	Below 14	Below 12	14 - 19	12 - 17	Above 15	Above 17
70 – 79	Below 12	Below 10	12 - 17	10 - 15	Above 17	Above 15
80 – 89	Below 10	Below 08	10 - 15	08 - 13	Above 15	Above 13

II. ARM CURL (BICEP) TEST

Purpose : To measure Upper Body Strength and Endurance.

Objective : To complete maximum arm curls in 30 seconds.

Infrastructure/Equipments Required : 4 pound dumb-bell/weight (for women) or 8 pound dumb-bell/ weight (for men), a chair without armrest and stopwatch.

Test Administration :

(*i*) The aim of test is to do as many arm curls as possible in 30 seconds. This test is conducted on the stronger / dominant arm side.

(*ii*) The person sits on the chair holding the dumb-bell/weight and arm is vertically downward position beside chair.

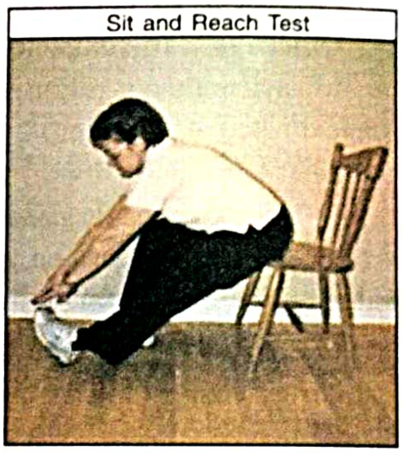
(*iii*) Brace the upper arm against the body so that only the lower arm is moving.

(*iv*) Curl the arm up through a full range of motion (flexion of arm) and afterwards arm down (extension of arm). Repeat this action as many times as possible within 30 seconds.

Evaluation : The number of complete curl actions (up and down considered as one) is score in 30 seconds. Norms/Chart to reference is given.

Age in years (In No.)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	Below 15	Below 13	15 - 13	13 - 18	Above 20	Above 18
70 – 79	Below 13	Below 11	13 - 11	11 - 16	Above 19	Above 16
80 – 89	Below 11	Below 09	11 - 16	09 - 14	Above 18	Above 14

III. CHAIR SIT AND REACH TEST


Sit and Reach Test

Purpose : To measure the Lower Body Flexibility.

Objective : To stretch the lower body as far as possible.

Infrastructure/Equipments Required : Straight back chair without arms; 18 inches.

Test Administration :

(*i*) The person sits on the edge of chair, one foot on floor whereas other leg is extended forward with the knee straight; heel on floor and ankle bent at 90°. One hand is on top of other.

(*ii*) Then person is instructed to inhale then exhale and reach towards the toes by bending at the hip.

(*iii*) Keep the back straight and head up. Avoid jerky actions or quick movement and never stretch to the point of pain.

(*iv*) Keep the knee straight and hold the reach for 2 seconds.

(*v*) The distance between toes and finger tips is measured in inches.

Evaluation : If finger tips touch the toes the score is zero. If it does not touch the toes then distance between toes and finger tips is negative. If it overlaps the toes then the score is positive. Perform this test twice and consider the best. Norms / Chart for reference is given.

Age in years (In Centimeter)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	Below 14	Below 12	14 - 19	12 - 17	Above 15	Above 17
70 – 79	Below 12	Below 10	12 - 17	10 - 15	Above 17	Above 15
80 – 89	Below 10	Below 08	10 - 15	08 - 13	Above 15	Above 13

IV. BACK SCRATCH TEST

Purpose : To Measure the Upper Body Flexibility (General Range of Motion of Shoulder).

Objective : To touch or overlap the finger of the both hands behind the back.

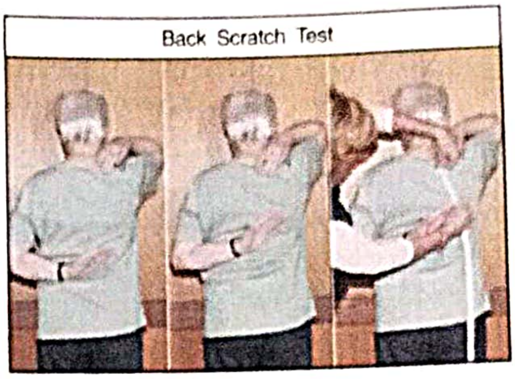
Infrastructure /Equipment Required : It requires a ruler (length scale).

Test Administration :

(i) Test is done in standing position. One hand is placed behind the head over the shoulder and reaches as far as possible down the middle of back whereas palm touching the body and fingers directed down.

(ii) Place the other hand behind the back palm facing outward and fingers upward and reach up as far as possible attempting to touch or overlap the middle fingers of both hands.

(iii) An assistant is required to direct the person so that fingers are aligned to measure the distance between the tips of middle fingers.


Back Scratch Test

Evaluation : If finger tips touch each other, then score is zero. If they do not touch, then measure the distance between finger tips as positive score. If it overlaps, then measure the distance as negative score. Try this test twice and consider the best. Stop the test if person experiences pain.

Norms/Chart for reference is given.

Age in years (In Centimeter)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	– 3	– 2	– 3 to +3	– 2 to +3	Above +3	Above +3
70 – 79	– 4	– 3	– 4 to +2	– 3 to +2	Above +2	Above +2
80 – 89	– 5	– 4	– 5 to +1	– 4 to +1	Above +1	Above +1

V. EIGHT FOOT UP AND GO TEST

Purpose : To measure, Agility (Coordinative ability), Speed and Balance.

Objective : To stand and walk 16 feet and sit back as fast as possible (without running).

Infrastructure/Equipments Required : The equipments required are stopwatch, straight back chair (approximately 45 cm high), cone markers, measuring tape, safe and clear area.

Test Administration :

(i) Place the chair against wall and mark a cone eight feet away in front of chair.

(ii) Clear the path between the chair and the marker.

(iii) The person sits on chair, hands resting on knees and feet flat on floor.

(iv) On the command 'GO' timing starts and person is instructed to walk (no running) around the cone as quickly as possible and sit down on the chair.

8-FEET-UP AND GO TEST

Evaluation : Scoring is counted as time taken to perform this. Two trials are conducted and lowest time in seconds is considered for scoring. Norms / Chart for reference is given.

Age in years (In Seconds)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	Above 5	Above 6	4 to 5	5 to 6	Below 4	Below 5
70 – 79	Above 7	Above 8	5 to 7	6 to 8	Below 5	Below 6
80 – 89	Above 9	Above 10	6 to 9	8 to 10	Below 6	Below 7

VI. SIX MINUTE WALK TEST

Purpose : **To measure Aerobic Endurance.**

Objective : To walk maximum distance in 6 minutes.

Infrastructure/Equipments Required : Measuring tape to mark track distance, stopwatch, chairs positioned for resting.

Test Administration :

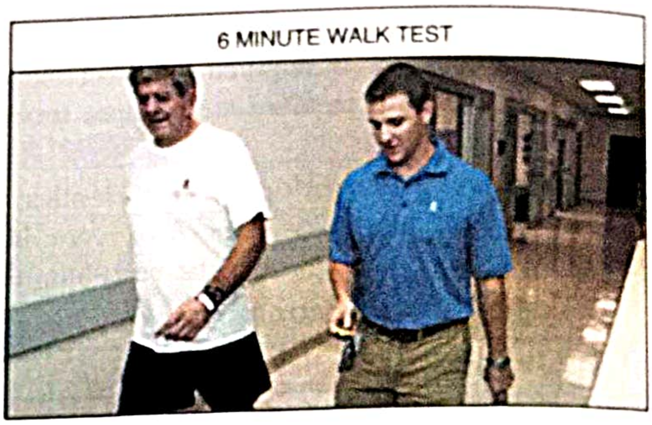
(*i*) The walking course / track is laid in rectangular area (45 × 5 m^2) with cones marking the area at regular interval.

(*ii*) The aim of test is to walk as quickly as possible for six minutes to cover maximum distance.

(*iii*) Persons set their own pace. They can take rest if desire.

Evaluation : Measure the distance covered by person in six minutes walk test in meters.

Norms / Chart for reference is given.


6 MINUTE WALK TEST

Age in years (In meters)	Below Average		Average		Above Average	
	Men	Women	Men	Women	Men	Women
60 – 69	Below 550	Below 520	550 to 650	520 to 620	Above 4	Above 620
70 – 79	Below 500	Below 470	500 to 600	470 to 570	Above 5	Above 570
80 – 89	Below 450	Below 420	450 to 550	420 to 520	Above 6	Above 520

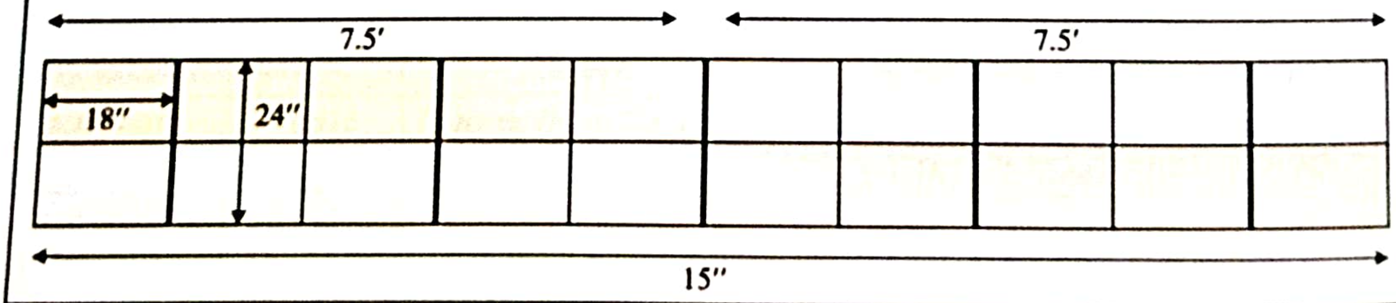
5. JOHNSON-METHENY TEST OF MOTOR EDUCABILITY

This test battery was initially designed by **Metheny later revised by Johnson in 1932. The test battery consists of the following four motor stunts; (Front roll, Back roll, Jumping half-turns, Jumping full-turns).**

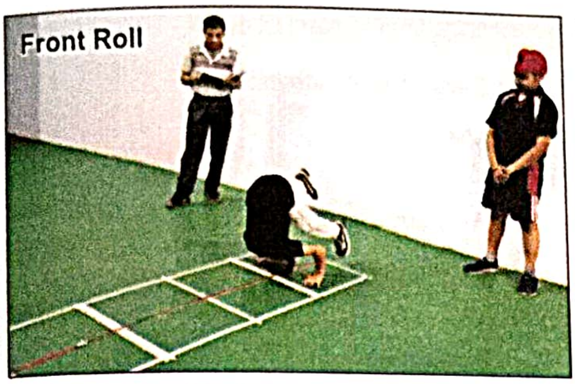
Purpose : **To check the Motor Educability of students of high school.** (The motor educability is the ability to learn well different motor skills quickly and easily.

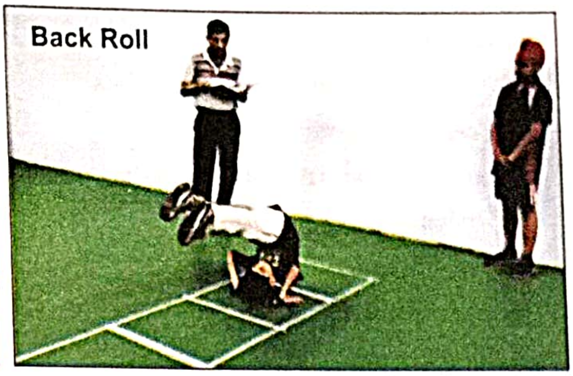
Test Area : A canvas measuring 15 feet in length and 2 feet wide is marked as shown in figure 1. The 15 feet length is divided into ten sections of each 18 inches. The width of the transverse lines is ¾ inch and 3 inches alternatively as show in figure 1. So that centre of lines remains 18 inches apart. Another ¾ inch wide line is marked lengthwise in the middle of the canvas length. This properly marked piece of canvas is placed over a gymnasium mat with the sides and ends properly tucked to the mat so that the canvas remains properly stretched. Alternatively, the above area may be directly painted or marked on the gymnasium mat without using the canvas.

JOHNSON-METHENY TEST AREA



Test item 1 Front Roll : The subject is asked to start outside the marked area and perform two front rolls, one up to 7.5' i.e. 3" wide center line and the other in the second half of 7.5'. The subject is to perform the rolls without touching the limits or over reaching the zone mentioned above; ignoring the long middle dividing line.

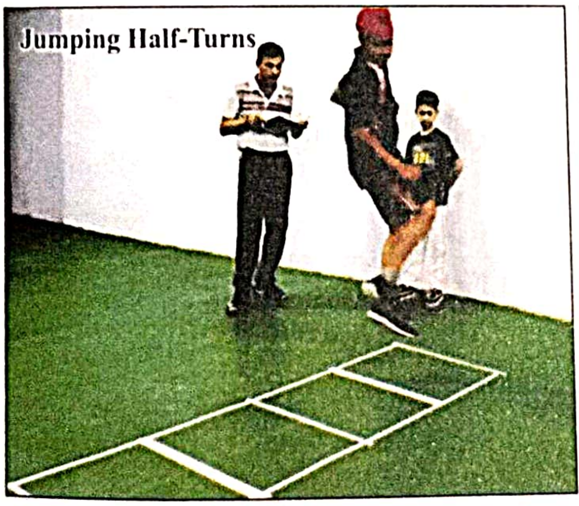


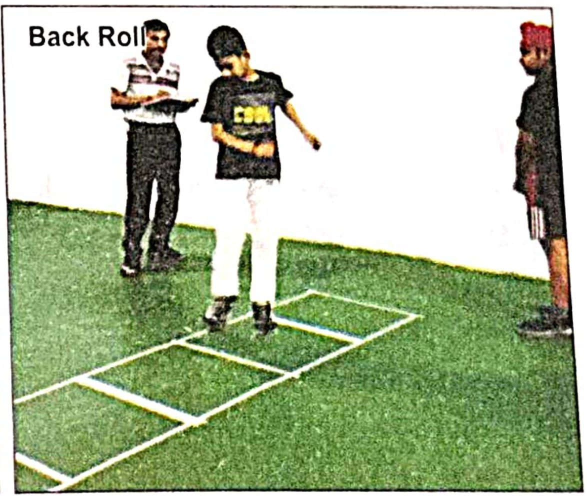


Test item 2 Back Roll : The test is similar to front roll both in performing and scoring. The subject is to start outside the marked chart area and is to perform two back rolls in the 2 feet lane area, one up to first half and the second back roll in the second half.

Scoring : Each correct roll (front roll/ back roll) gets 5 points, hence maximum of 10 points. Two points are deducted for overreaching side line, right or left for each roll; one point is deducted for over reaching the end limit on each roll and full five points are deducted when the subject fails to perform a true front roll.

Test item 3 Jumping Half-Turns : The subject is asked to start with feet on first 3-inch line, jump with both feet to second 3inch wide line, executing a half turn either right or left, jump third 3-inch line executing half turn in opposite direction to first half-turn and then to 4th and 5th on 3-inch wide lines executing half turns right and left alternatively.





Test item 3 Jumping Full-Turns : The subject is asked to start with feet outside marked area at about the centre of the lane. He/she is required to jump with feet together to second rectangular space, executing a full turn with the body either right or left; continue jumping to alternate rectangular spaces across the marked mat executing full turns, rotating body in same direction, landing on both feet every time.

Scoring : Perfect execution of four jumps (Jumping Half Turn/ Jumping Full Turns) is worth ten points. Only 2 points are deducted for each wrong jump when the subject either does not land with both feet on the 3 inch line or turns the wrong way or both.

Evaluation : Good player can score more than 35 points average player is between 30 to 34 points and bad player is below 30 points.

UNIT 7

PHYSIOLOGY AND INJURIES IN SPORTS

TOPICS & LEARNING OUTCOMES

1. **Physiological factors determining Components of Physical Fitness :** ***In this topic we will understand how the various components of fitness bring physio logical changes in the body. Also which physiological factor affects that component.***
2. **Effects of Exercise on Cardio-Respiratory System : Give us understanding how this system improves through regular exercises.**
3. **Effects of Exercise on Muscular System : Effects of Exercise on Cardio-Respiratory System : Give us understanding how this system improves through regular exercises.**
4. **Physiological changes due to ageing : Learn about the changes caused due to ageing.**
5. **Sports Injuries: Classification (Soft Tissue Injuries – (Abrasion, Contusion, Laceration, Incision, Sprain & Strain) Bone & Joint Injuries – (Dislocation, Fractures, Green Stick, Commuted, Transverse, Oblique & Impacted) Causes, Prevention & Treatment : In this topic we will understand the various injuries and their classification causes and prevention. How to give First Aid and Treatment to that injury.**

1. PHYSIOLOGICAL FACTORS DETERMINING PHYSICAL FITNESS

(A) PHYSIOLOGICAL FACTORS DETERMINING ENDURANCE

Endurance is an ability to withstand fatigue. It is of two types : Aerobic and Anaerobic endurance. Endurance is an important component of physical fitness. The physiological factors which determine endurance are :

***(i)* Maximal Oxygen Uptake** : Maximum / Maximal Oxygen Uptake /intake (VO_2 max) refers to the highest rate at which Oxygen can be taken up and consumed by body during intense exercise. Thus, this enhanced oxygen utilization during exercises will improve mitochondrial respiration and subsequently endurance improves.

***(ii)* Pulmonary Diffusion** : Pulmonary diffusion is the exchange of oxygen and carbon dioxide between lungs and the blood. More and faster pulmonary diffusion improves the endurance.

***(iii)* Cardiac Output** : Cardiac output is the ability of heart to pump out blood in one minute. Cardiac output helps to circulate blood to working tissues, thus endurance is enhanced.

***(iv)* Lactate Threshold** : Lactate threshold is the ability to tolerate the lactic acid in blood produced during anaerobic activity. Better lactate threshold delays fatigue and tiredness, thus endurance improves.

***(v)* Aerobic Capacity** : It is the capacity of an individual to work for long duration with slow speed. This ability improves with regular exercise.

***(vi)* Blood Volume and Flow** : Endurance activities need sufficient amount of oxygen and nutrients which are transported by blood. The regular training increases the haemoglobin in red blood cells and increases blood plasma by which endurance is boosted.

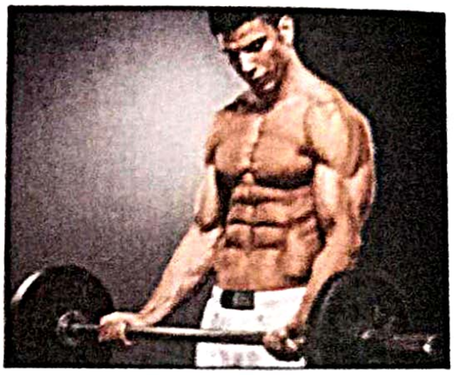
***(vii)* Hydration** : Endurance activities cause sweating and loss of important minerals. Thus, sufficient amount of water is required which helps to improve endurance.

***(viii)* Red Muscle Fibers** : The red muscle fibers (slow-twitch muscle fibers) can carry more oxygen, thus helpful for aerobic endurance. Thus, the higher percentage of red muscle fiber increases endurance.

Percent of Muscle Fibers Required for Different Sports Activities

Sports Activity	% of Slow Twitch Muscle Fiber	% of Fast Twitch Muscle Fiber
Long Distance Runners	70 to 80 %	20 to 30 %
Sprinters	25 to 30 %	70 to 75 %
Non-Athletes	48 to 52 %	48 to 52 %

(B) PHYSIOLOGICAL FACTORS DETERMINING STRENGTH



Strength is the ability to resist or overcome resistance. It is of three types : Maximal Strength, Explosive Strength and Strength endurance. Factors which affect the strength are :

***(i)* Muscles covering Sarcolemma** : **The muscle fibers covering 'Sarcolemma' bind the muscles to work together.** The Sarcolemma covering increases the muscle cross-sectional area and helps in strength component.

***(ii)* White Muscle Fibers** : White muscle fibers (fast twitch muscle fibers) have more connective tissues and they bring fast and strong contractions. **Greater percentage of white muscle fibers help in explosive strength.**

***(iii)* Muscular Contraction** : Muscular contraction is of two types : Concentric and Eccentric. It regulates our muscular action in controlled manner. It helps in accuracy and efficiency of movement, thus helpful in strength development.

***(iv)* Muscle Length** : Every muscle is of different size. **Long muscles have more potential of strength as compared to small muscles.**

***(v)* Myoglobin** : **Myoglobin is a type of protein present in muscle fibers to store oxygen which produces energy during emergencies.** Thus, higher myoglobin increases the strength of individual.

***(vi)* Nerve Impulses** : Nerve impulses are the brain messages to skeletal muscles to respond. **The strong nerve impulse brings powerful contraction of muscles thus the strength is higher.** The intensity of neuromuscular responses (impulses) determine strength.

***(vii)* Adequate Energy** : The muscular movements need sufficient energy. **Greater number of mitochondria in muscle fibers produces more energy and stronger and longer muscular contraction.**

***(viii)* Age** : Strength of muscles is maximum between 20 to 40 years of age and then gradually weakens.

***(ix)* Gender** : Men have more strength as compared to women due to bigger and longer muscle length.

***(x)* Body Weight** : Body weight is also related with strength of an individual.

(C) PHYSIOLOGICAL FACTORS DETERMINING SPEED

Speed is an ability to do work at faster rate. It has three parts : Reaction time, Acceleration, and Speed of Movement and Locomotors Ability. **Speed basically depends upon heredity (80%) and good training (20%).** It also depends upon strength, endurance, flexibility and coordinative ability. The physiological factors which determine speed are :

(*i*) Fast Twitch Muscle Fiber : The greater the percentage of fast twitch muscle fibers (white muscle fibers), faster is the speed.

(*ii*) Neuromuscular Responses : Higher and faster the neuromuscular responses (motor impulses), faster and stronger is the muscle contraction, thus gains speed.

(*iii*) ATP Energy Store : Greater the ATP storage (Phosphates stores), faster is the energy release for speedy and anaerobic activities.

(*iv*) Flexibility : Higher the flexibility, more is the range of movement, thus helpful in speed.

(*v*) Anaerobic Capacity : An anaerobic capacity increases the short term endurance of an individual, it also improves the speed ability of an individual.

(*vi*) Coordinative Ability : Speed is also dependent on coordinative ability.

(*vii*) Strength : Strength ability also helps to increase the speed of individual. It is directly related with speed.

(D) PHYSIOLOGICAL FACTORS DETERMINING FLEXIBILITY

Flexibility is an ability of joints to move in maximum range. Flexibility is of two types : Passive flexibility and Active flexibility. Following physiological factors determine flexibility :

(*i*) Joint Articulation : The joint structure or articulation is the main factor of flexibility. It is attached to various muscles, ligaments, cartilages and tendons. It makes the joint strong and flexible.

(*ii*) Ligament Elasticity : Ligament connects two or more bones around the joint. More the elasticity of ligaments, greater is the flexibility of the joints.

(*iii*) Muscle Stretch ability : Higher the muscle stretch ability, more is the range of joint movements, thus helpful in flexibility.

(*iv*) Disease or Injury : Many types of diseases affect flexibility like Parkinson's, a Rheumatoid Arthritis etc. Injury also affects the flexibility of individual.

(*v*) Age : Children have more flexibility than adults. Age is directly related with flexibility.

(*vi*) Gender : Females have more flexible body than males due to anatomical structure.

(*vii*) Warming-up : Good warming-up improves the flexibility of an individual.

(*viii*) Heredity : Heredity is also related with flexibility as its joint structure and its articulation is related with heredity.

2. EFFECTS OF EXERCISE ON CARDIO-RESPIRATORY SYSTEM

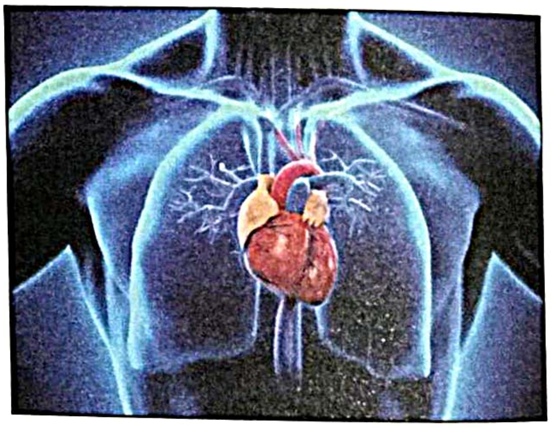
Cardio-respiratory system is the combination of Circulatory and Respiratory systems. It helps to provide oxygenated blood to working muscles (during exercise). This oxygenated blood reaches to working muscles through blood vessels like arteries, arterioles, veins etc. Thus, it is the system which provides energy to body during exercise.

(A) SHORT TERM EFFECTS ON CARDIO RESPIRATORY SYSTEM

(*i*) Increased in Cardiac Output : Cardiac output is the amount of blood pumped out in one minute, *i.e.* it is the product of stroke volume by heart rate per minute. Regular training increases the cardiac output. Thus, more blood is pumped out from heart for the working tissues.

(*ii*) Return of Normal Pulse Quickly : The pulse or heart rate returns to normal quickly after exercise. Thus, body feels relaxed after some time.

(*iii*) Faster Adaptation to Working Load : In a trained person, the heart can adapt to working load quickly, *i.e.* quick adjustment of heart according to body needs.



(*iv*) Maximal Oxygen Uptake Ability Increases : It is the maximum amount of oxygen utilized by body during exercise. The alveoli efficiency improves, *i.e.* maximal oxygen uptake ability increases. Thus, more oxygen reaches the working tissues for energy production during stressful activity.

(*v*) Increase in Vital and Tidal Volume : With regular exercise the Tidal Volume (volume of air inhaled / exhaled during normal breathing) and Vital Capacity (maximum amount of air exhaled after deep inspiration) of lungs increase, by which more oxygen reaches to working tissues.

(*vi*) Faster Removal of Waste : There is faster removal of waste products from the body; moreover, there is better defence against diseases, germs, etc.

(*vii*) Hydro-Balance in Body : The water/hydro balance in body is maintained through exercise. Thus, dehydration can be delayed.

(*viii*) Decrease in Blood Viscosity (Density) : The blood viscosity decreases, *i.e.* plasma content increases. Therefore, there is an easy and fast flow of blood through capillaries, moreover, faster circulation of blood.

(*ix*) Respiratory Rate Increases : Our body requires more oxygen during exercise, and to meet this increased demand, respiratory system increases the respiratory rate (breathing rate).

(*x*) Increased Blood Pressure : Endurance exercise leads to increase in systolic blood pressure which is in direct proportion to the increase in exercise intensity.

(*xi*) Rate of Exchange of Gas Increases : Regular exercise increases the rate of exchange of gas in lungs.

(B) LONG TERM EFFECTS ON CARDIO RESPIRATORY SYSTEM

(*i*) Hypertrophy of Heart and Increase in Stroke Volume : With regular exercise the hypertrophy (enlargement) of heart takes place. Thus, there is an increase in stroke volume.

(*ii*) Resting Pulse Increases : With increased cardiac output the basal heart rate decreases, thus the resting time of heart increases. Therefore, heart is not stressed during normal work.

(*iii*) Lactate Threshold Increases: During anaerobic endurance lactic acid is produced in muscles causing pain and fatigue. This lactic acid increases tolerance in muscles.

(*iv*) New Capillaries are Formed : Regular exercise develops new capillaries. This brings more blood to working tissues. Thus, improves the efficiency of muscles.

(v) Increase in Number of Alveoli and Pulmonary Diffusion : Through regular training the number of alveoli increases (which purifies more blood). Thus, the efficiency of respiratory system is improved. In a trained person, there is faster removal of carbon dioxide and oxygen attaches to blood; thus faster pulmonary diffusion.

(vi) Increased Lung volume : Continuous exercises done for long duration help to increase the capacity and volume of lungs. Vital capacity increases almost 100 % as compared to that of a normal individual.

(vii) Increase in Aerobic Endurance : With regular exercise less amount of lactic acid is produced. Therefore, fatigue is delayed, hence improves endurance.

(viii) Improves Metabolic System : In a trained person, the metabolic reactions are faster for energy production with less consumption of oxygen, thus efficient energy production.

(ix) Respiratory Muscles become Strong and Efficient : The respiratory muscles (Intercostals and Diaphragm muscle) become strong to work maximally for longer duration, thus helpful during stressful activity.

(x) Chemical Composition of Blood Improves : Regular exercise improves the chemical composition of blood like increase in Plasma, RBCs, WBCs, Thrombocytes, Leucocytes, Platelets, Haemoglobin (in RBCs) etc., thus improves quality of blood.

(xi) Blood Pressure Regulation : A well-balanced blood pressure is maintained with regular exercise; moreover, proper body temperature is regulated throughout the body.

(xii) Reduction in Cardiac Problems : Regular exercise decreases the cholesterol level in blood, therefore, reducing heart attack risk and other cardiac problems.

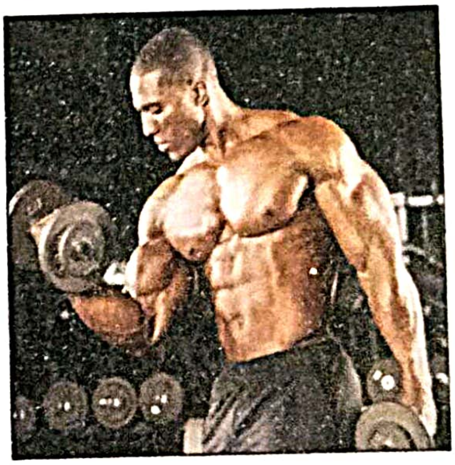
(xiii) Faster Healing : The increased circulation of blood makes healing faster, therefore, there is faster recovery from injuries.

(xiv) Increases Resistance Power : Through regular exercise the resistance power (immune system) improves, thus common health problems like cold, cough, asthma, sneezing, headache, etc. can be prevented.

3. EFFECTS OF EXERCISE ON MUSCULAR SYSTEM

(A) SHORT TERM EFFECTS ON MUSCULAR SYSTEM

(i) Efficiency Improvement : As a result of regular exercise, there is an increase in the number of capillaries in muscles. By this, there is increased and faster circulation of blood, thus it improves the efficiency of muscles.



(ii) Increased Muscle Temperature: During exercise muscles demand energy, which comes from contracting muscles.

(iii) Accumulation of Lactic Acid : Muscles require oxygen. If blood supply does not provide appropriate volume of oxygen to muscles, it leads to accumulation of lactic acid in muscles which result in pain, and soreness in muscles.

(iv) Increased Muscle Flexibility: Due to increase in blood flow and rise in temperature, elasticity of muscles increases. Stretching and mobility exercises also play a dominant role in increasing muscular flexibility.

(B) LONG TERM EFFECTS ON MUSCULAR SYSTEM

(i) Hypertrophy of Muscles : Regular exercise brings hypertrophy of muscles, thus increases the muscle mass, *i.e.* increase in myoglobin content of muscles and control weight of a person.

(ii) Gain in Strength : With regular exercise there is gain in muscular strength and power. This gain of strength is the result of thickening of sarcolemma and strengthening of muscles, ligaments and tendons.

***(iii)* Lactate Threshold Increases :** Regular exercise increases the ability of muscles to tolerate more lactic acid for longer duration, i.e. lactate threshold increases, thus muscles delay tiredness and fatigue. It improves anaerobic endurance.

***(iv)* Increase in Glycogen Storage :** Glycogen is generally stored in muscles and liver. Regular exercise helps the body to increase the storage of glycogen which may give continuous energy.

***(v)* Increase in Aerobic and Anaerobic Endurance :** A trained muscle has more aerobic endurance, therefore, its capacity to work for longer duration without fatigue, is improved.

***(vi)* Increase in Size and Number of Mitochondria :** Aerobic exercise leads to increase in size and numbers of mitochondria which take in more oxygen and produce more ATP and energy.

***(vii)* Proper Shape of Body :** Regular exercise provides proper shape to the body, thus improves physical personality; moreover, removes excessive fats from muscles.

***(viii)* Faster Recovery from Injury :** Trained muscles can recover from injury very fast; moreover, there are less chances of injuries.

***(ix)* Emergency Stores of Energy Improve :** The ATP and ADP sources (in mitochondria) increase by which muscles can produce more energy. It also increases the Oxygen Debt capacity, thus improves muscle efficiency.

***(x)* Desired Strength Developed :** Systematic and scientific training can develop the desired strength and endurance.

***(xi)* Faster Responses :** In trained muscles, the stimulus travels faster, thus muscle actions and responses are faster. Moreover, muscles remain in toned up condition which improves the reflex action. Body remains active throughout.

***(xii)* Efficient Use of Diet :** Trained muscles can efficiently use carbohydrates, proteins, fats, etc. as sources of energy with less consumption of oxygen.

***(xiii)* Better Neuro-Muscular Coordination :** Regular exercise improves the neuromuscular coordination by which various skills can be performed efficiently, economically and accurately.

4. PHYSIOLOGICAL CHANGES DUE TO AGEING

With the onset of old age (Ageing process) the specific threshold performance deteriorates. Most of the physiological functions apparently have their own individual's peak performance which declines with the age. **The physiological functions reach their peak performance somewhere between the age of 20 and 30 years.** Researchers have proved that most of the body systems and their functions gradually decrease with the age (after reaching their peak performance). The physical performance increases with advancing age depending upon heredity (Genes), less physical activity, diseases, health problem, sedentary lifestyle, poor diet, overstress or tension, pollution or unhygienic environment, taking intoxicants, etc. The biological ageing process can be delayed with regular training or exercises. The physiological changes accompanying the ageing process and the effect of exercises are given below.

S.No.	Physiological Function	Age Effect	Changes due to Regular Exercise
(i)	Muscle Size	Increases	Decreases
(ii)	Muscle Strength	Increases	Decreases
(iii)	Body Weight	Increases	Decreases
(iv)	Output and Stroke Volume	Increases	Decreases

S.No.	Physiological Function	Age Effect	Changes due to Regular Exercise
(v)	**Heart Rate**	Increases	Decreases
(vi)	**Cardiac Muscle Strength**	Increases	Decreases
(vii)	**Elasticity of Blood Vessels**	Increases	Decreases
(viii)	**Maximal Blood Flow**	Increases	Decreases
(ix)	**Maximal Oxygen Intake**	Increases	Decreases
(x)	**Basal Metabolic Rate**	Increases	Decreases
(xi)	**Chest Expansion**	Increases	Decreases
(xii)	**Vital Capacity**	Increases	Decreases
(xiii)	**Pulmonary Diffusion Capacity**	Increases	Decreases
(xiv)	**Endurance**	Increases	Decreases
(xv)	**Neuro Muscular Responses**	Increases	Decreases
(xvi)	**Reaction Time**	Increases	Decreases
(xvii)	**Speed of Movement**	Increases	Decreases
(xviii)	**Flexibility**	Increases	Decreases
(xix)	**Coordinative Ability (Agility)**	Increases	Decreases
(xx)	**Glandular Functioning**	Increases	Decreases
(xxi)	**Overall Health**	Increases	Decreases
(xxii)	**Physical Fitness**	Increases	Decreases
(xxiii)	**Bone Mass**	Increases	Decreases
(xxiv)	**Immune System**	Increases	Decreases
(xxv)	**Diet**	Increases	Decreases
(xxvi)	**Health Problems**	Increases	Decreases
(xxvii)	**Blood Pressure**	Increases	Decreases
(xxviii)	**Per Cent Body Fat**	Decreases	Increases

5.(A) MEANING OF SPORTS INJURIES

Every person is prone to injuries or accidents, irrespective to preventive steps physical fitness level or safety measures. **Sports Injuries are referred as all those injuries which occur to individual during participation in sports or on playfield or during competition or in day today life during movement. It may be over the skin, muscle, bone or in combination. It causes pain, restriction to movement or physical demage to organ or impairment to performance etc.** It may be due to incorrect movement, jumping, throwing, hitting, colliding, equipment failure, lack of warming-up, faulty skill action, over training etc. Sports injuries require specific first-aid; treatment steps or remedies.

According to Morris : "An athletic injury is defined as some physical damage to the body that occurs during athletic practice or competition causing a resultant loss of capacity or impairing performance."

Sports medicine is also known as exercise medicine. It is the branch of medicine that deals with the diagnosis, treatment and prevention of injuries related to sports. It includes the assessment and management of patients with musculo-skeletal injuries and medical problems arising from sporting activity.

Sports physician possesses the expertise in general medicine and rehabilitation along with nutrition, biomechanics, exercise physiology, psychology, etc. The International Federation of Sports Medicine (FISM) is the body to provide guideline for sports injuries. Its function is not only curative and preventive but also rehabilitative. The primary focus of sports medicine is rapid and full recovery of patient from injury.

According to Thesaurus, "It is the branch of medicine concerned with the treatment of injuries or illness resulting from athletic activities."

According to Webster College Dictionary, "It is the branch of medicine concerned with athletic conditioning and nutrition, the treatment and prevention of athletic injuries and the improvement of athletic performance."

5.(B) CLASSIFICATION OF SPORTS INJURIES

Sports Injury are those types of injuries that occur during participation in sports or games, training or competitions. In sports, injuries are common and it can occur to anyone at anytime. Injury causes damage to any part – external or internal, which affects the health of an individual. Injuries can be classified as :

(I) SOFT TISSUE INJURIES : It is further of two types :

(a) Skin Injuries : It is an injury over skin like Contusion, Abrasion, Laceration, Incision, etc.

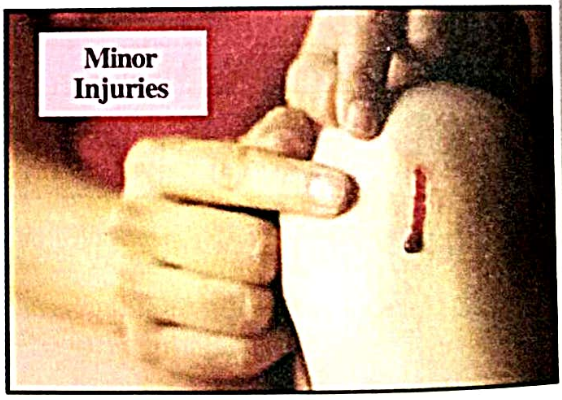
(b) Muscle Injuries : In this injury the muscles, tendons and ligaments are affected like Sprain, Strain etc.

(II) HARD TISSUE INJURIES : These injuries involve damage to bones of skeletal system like Fracture and Dislocation.

Injuries are further categorized as Minor injuries and Serious (Major) injuries.

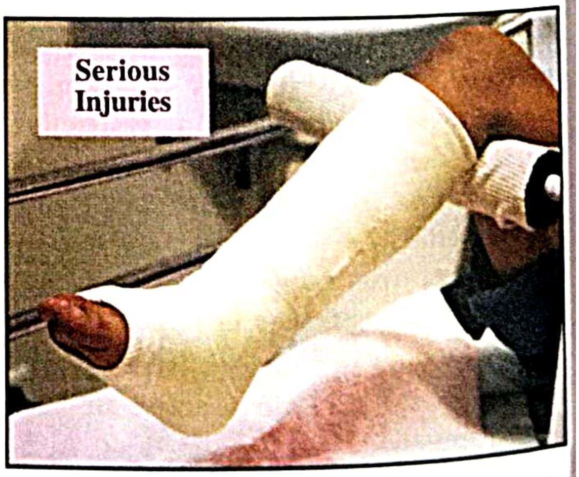
MINOR INJURIES

These injuries do not affect much to the fitness of a player. They are less painful. The pain vanishes after sometime. In minor injuries, there is localized inflammation caused due to some damage over skin or muscles tissues. These injuries are caused by overuse of affected part. The patient gets relief by taking sufficient rest. In some cases, specific treatment is also required.



SERIOUS INJURIES

These injuries causes lot of pain and localized inflammation around the affected part. In these injuries, the health is affected and it declines the performance of a player. In serious injuries skin, muscle, tendons, ligaments and bones are damaged along with rupture of blood vessels or nerves etc.



Classification of Sports Injuries			
Soft Tissue Injuries		**Hard Tissue Injuries**	
Skin Injuries	**Muscle Injuries**	**Bone Injuries**	**Combination of Muscle and Bone Injury**
Contusion : Caused by severe blow without breaking the continuity of skin.	**Cramp** : It is neuro-muscular injury over muscles; where muscles cannot contract properly.	**Fracture** : It is damage or breakage of bone by external pressure. It is of various types : **Closed Fracture :** Hairline/ Greenstick Fracture Impacted Fracture, Stress Fracture, Transverse Fracture, Oblique Fracture, Linear Fracture, Incomplete Fracture, Complete Fracture. **Open Fracture :** Complicated Fracture, Compound Fracture	**Dislocation** : It is an injury in which the adjoining bones are displaced from their original position. Commonly affected areas (a) Shoulder Dislocation (b) Hip Dislocation (c) Knee Dislocation (d) Elbow Dislocation
Abrasion : Skin is scrapped or rubbed by friction. It is not deep.	**Sprain/ Muscle Pull** : It is damage or breakage of tendon by violent or overstretches of muscles.		
Laceration : It is a cut or wound and skin is torn by sharp object.	**Strain** : It is damage or breakage of ligament by violent or overstretches around joint.		
Incision : It is a deep cut or wound and skin is torn by blunt object.			
Minor Injury : These injuries do not affect much to the fitness of player. They are less painful and vanish after sometime(if proper treatment is taken). It has localized inflammation and mostly over skin and muscles.		**Major Injury** : These injuries affect the health and fitness of player. They are very painful and need specific treatment. It has inflammation around the affected part and mostly over tendon, ligament and bone. The blood vessels gets damaged in this injury.	

5.(C) SOFT TISSUE INJURIES; AND THEIR PREVENTION AND TREATMENT

(A) CONTUSION

Contusion

It is the crushing of soft tissues by a violent external force without breaking the continuity of skin. It causes collection of blood over the skin. It is a type of Hematoma. Contusion is the injury of skin caused by severe blow or impact by external object without breaking the continuity of skin. Generally, contusion is caused due to hitting of blunt object. It causes acute pain and sometimes loss of function of affected part and swelling over that part.

There may be pain, swelling and discolouration of skin, i.e. there may be red or bluish mark over the skin. This is caused by hit or blow from extreme object.

Prevention, First Aid and Treatment of Contusion :

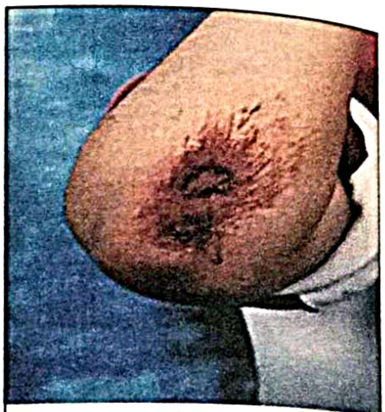
(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.

(*ii*) Contusion should be treated immediately with ice application (Cold compression) for some duration (after short intervals). Later repeat it after every six hours.

(*iii*) Apply Non-steroidal anti-inflammatory creams or ointments after one day to reduce pain and swelling.

(*iv*) After two days massage should be done over the affected part to reduce swelling.

(B) ABRASION


Abrasion

Abrasion is an injury on the surface of the skin. In this injury, skin is scrapped or rubbed by friction. It causes severe pain and sometimes bleeding over affected part. It rubs the upper layer of skin (epidermis). It exposes the blood vessels and the superficial layer of skin is scraped off. This injury is commonly caused by sliding, slip over surface, friction, etc. Abrasion is common over knee, elbow, palm, etc. It tears the tissues in the body by sharp object. It may be external or internal. In Incision injury, the skin is torn out and wound is open.

Prevention, First Aid and Treatment of Abrasion :

(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.

(*ii*) Avoid further friction.

(*iii*) Clean the part with some antiseptic cream and wash it properly with soap to prevent infection.

(*iv*) Anti-Tetanus injection to be given.

(C) LACERATION AND INCISION

Laceration is a type of wound that happens when soft tissues (skin and muscles) in the body are torn. It is often caused by blunt object and is deep. It results in the outlet of internal organs.

Incision is a type of wound which is caused by sharp edged objects such as knife, razor, etc. Sometimes the arteries or veins may be cut. Blood usually comes out freely from incision. The Laceration and Incision injuries are considered as wounds. In Laceration and Incision injuries, there is bleeding from the affected part.

Prevention, First Aid and Treatment of Laceration and Incision :

(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.

(*ii*) Stop bleeding at the earliest by compression or by pressing or put compression bandages.

(*iii*) Clean the surface of the affected part by antiseptic such as Neosporin.

(*iv*) Cover the affected part with medicinal cotton bandage or apply band-aid.

(*v*) Repeat dressing or padding over the wound.

(*vi*) If injury is deep go for stitches at the earliest.

(*vii*) Avoid infection by putting medicinal cream over it.

(*viii*) Care should be taken till the injury is totally healed up.

Laceration

Incision

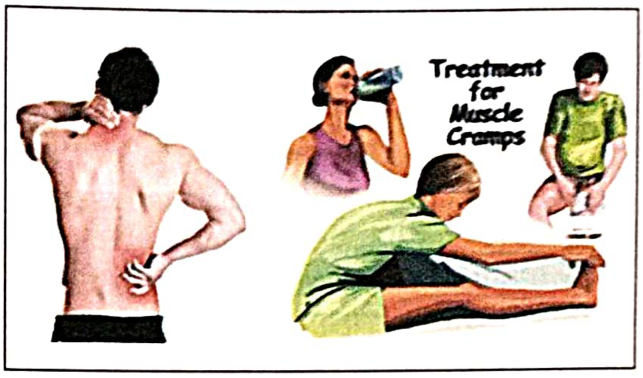
First aid Laceration

Cold Compression and apply Bandage

(D) CRAMP

Cramp is inability of muscles to contract properly causing severe pain over affected part. In other words, this is unbalance contraction of muscles. The causes of the cramp are due to overstraining muscles (over working of muscles without rest); loss of body water by sweating; physical activity during sickness; loss or lack of body salts or minerals; physical activity during extreme bad weather or climate; not performing proper warming-up, etc.

Prevention, First Aid and Treatment of Cramp :


Treatment for Muscle Cramps

(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.

(*ii*) Preventing over-exertion of muscles in excessive hot or cold climate.

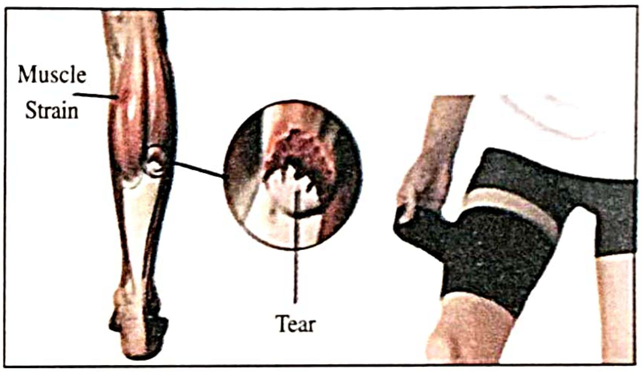
(*iii*) Complete rest to the affected individual.

(*iv*) Drink sufficient water (preferably salty lemon water or juices) during prolonged activity.

(*v*) Massage over affected part after sometime.

(*vi*) If pain is more, apply ice or cold compression for some duration.

(E) STRAIN


Muscle Strain
Tear

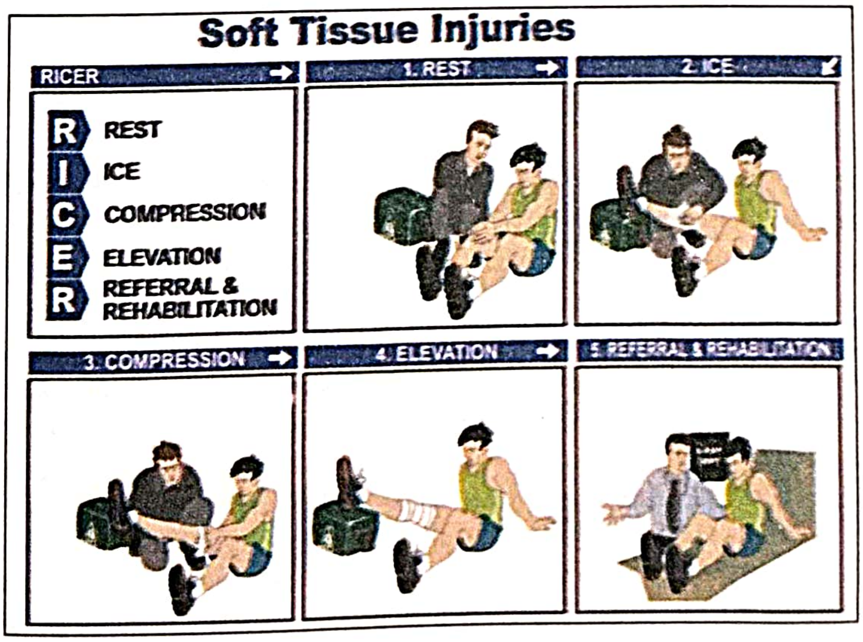
Strain injury is also named as Muscle Pull. In this injury the muscles or tendons are overused or overstress or overstretch due to violent pull. In other words, this is caused by the violent stretch of muscles beyond its normal limit. In strain injuries, muscle fibers get damaged or ruptured. It causes acute pain around the affected part, loss of function of injured muscles, local inflammation and swelling over the affected part. Mild strain is also known as cramp. It can be prevented by performing proper warming-up and avoiding jerky movements or actions.

RICE/RICER/PRICER TREATMENT

The treatment and management steps of Strain injury is referred as 'RICE' or 'RICER', i.e. Rest, Ice, Compression, Elevation and Rehabilitation (Referral for appropriate medical treatment). It is also referred as PRICER where 'P' stands for Protection.

Prevention, First Aid and Treatment of Strain Injury :

(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.


Soft Tissue Injuries
RICER
R REST
I ICE
C COMPRESSION
E ELEVATION
R REFERRAL & REHABILITATION
1. REST
2. ICE
3. COMPRESSION
4. ELEVATION
5. REFERRAL & REHABILITATION

(*ii*) Rest to player and completely restrict the movement of affected part.

(*iii*) Immediately apply cold compression or ice over the affected part to stop internal bleeding. Repeat this process for several times after some intervals.

(*iv*) Compression bandage should be applied over the affected part to reduce the swelling.

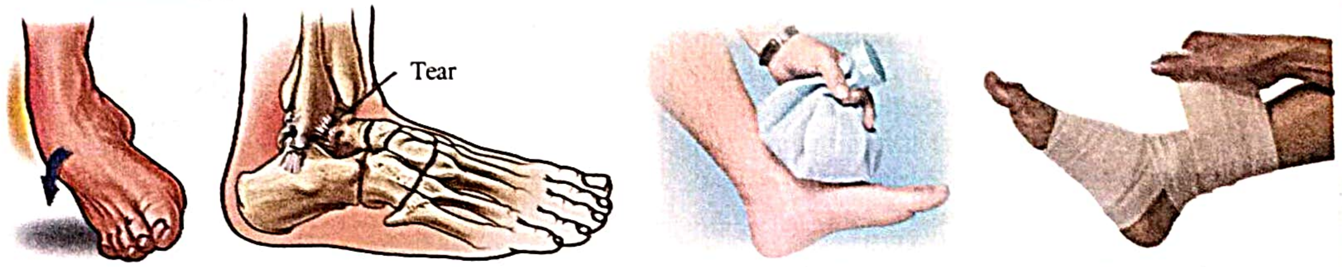
(*v*) Elevate the affected part above the level of heart by splint or support.

(*vi*) After two days apply inflammatory cream to reduce swelling and give gentle massage to the muscles or perform contrast bath (hot and cold bath) to reduce swelling.

(*vii*) After the treatment, the complete recovery is gained by Rehabilitation (Referral for appropriate medical treatment). Perform rehabilitation exercises or physiotherapy to regain strength to the muscles. This should be performed in progressive manner (Referral for appropriate medical treatment).

(F) SPRAIN

Sprain is the injury of ligament. In this ligament around the joint is torn or over stretched or twisted. In sprain injury, there is rupture of ligament or tendons. Sprain is very painful and it restricts the movement of joint. There is swelling as there is a lot of internal bleeding. Sprain injury is common to knee, ankle, wrist or elbow joints. It can be prevented by proper warming-up and avoiding jerky movement.



Apply Ice

Compression

RICE /RICER/PRICER TREATMENT

The treatment and management steps of Sprain injury is referred as 'RICE or RICER', i.e. Rest, Ice, Compression, Elevation and Rehabilitation (Referral for appropriate medical treatment). It is also referred as PRICER where 'P' stands for Protection.

Prevention, First Aid and Treatment of Sprain Injury :

(*i*) Wear proper safety gaurds while playing. It should consist of proper sports kit according to activity, like gloves, gaurds, helmets, shoes etc. Player should cover it as per activity needs and consider safety means.

(*ii*) Rest to player and completely restrict the movement of affected part.

(*iii*) Immediately apply cold compression or ice over the affected part to stop internal bleeding. Repeat this process for several times after some intervals.

(*iv*) Compression bandage should be applied over the affected part to reduce the swelling.

(*v*) Elevate the affected part above the level of heart by splint or support.

(*vi*) After two days apply inflammatory cream to reduce swelling and give gentle massage to the muscles or perform contrast bath (hot and cold bath) to reduce swelling.

(*vii*) After the treatment, the complete recovery is gained by Rehabilitation (Referral for appropriate medical treatment). Perform rehabilitation exercises or physiotherapy to regain strength to the muscles. This should be performed in progressive manner (Referral for appropriate medical treatment).

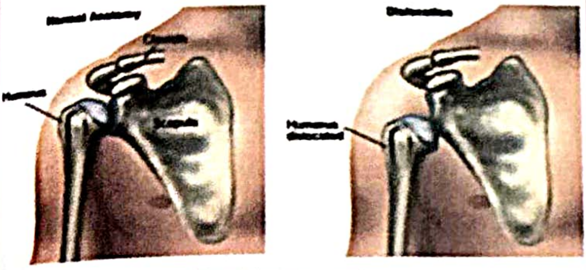
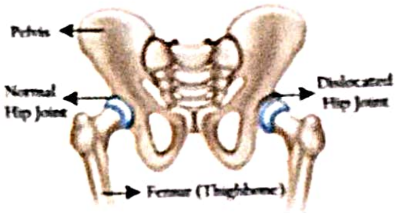
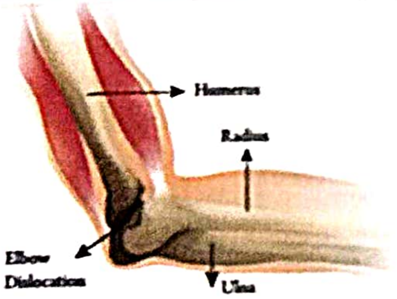
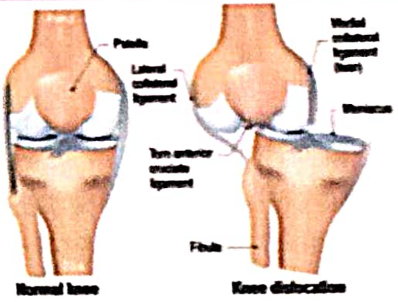
5.(D) HARD TISSUE INJURIES (BONE INJURIES) & THEIR MANAGEMENT

Bone injury is a serious injury and it is very painful. If bone injury is not handled properly, it may lead to permanent disability, thus to be handled by an expert doctor. The first aid steps are to immobilize the part and stop bleeding (internal or external bleeding) by applying ice (cry therapy). In this way, further damage can be avoided. Bone injury can be classified as dislocation or fracture. It is again of various types, like simple and complicated, in which blood vessels or nerves are damaged.

(A) DISLOCATION

It is an injury of joint in which the adjoining bones are displaced from their original position. It may be associated with sprain or fracture. It is also referred as subluxation.

Causes : Dislocation is mainly caused due to direct or indirect impact over the joint like fall, accident, weakening of muscles and tendons etc. It may be simple dislocation, fractured dislocation or complicated dislocation. Dislocation is common in throwing, jumping events and contact games.

DISLOCATION	
Shoulder	**Hip**
 Shoulder Dislocation	 Pelvis Normal Hip Joint Dislocated Hip Joint Femur (Thighbone) Hip Dislocation
Elbow	**Knee**
 Humerus Radius Elbow Dislocation Ulna Elbow Dislocation	 Patella Fibula Normal knee Knee dislocation Knee Dislocation

Symptoms : Pain, swelling, bruising, instability of joint, loss of movement of joint, deformed joint etc. Deformity may arise if treatment is not given properly.

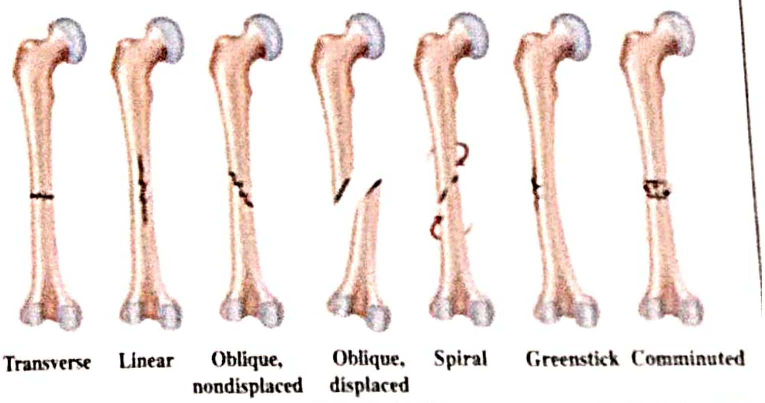
Prevention of Dislocation: It can be prevented by strengthening muscles; performing proper warming-up; controlling the excessive range of movements of joint and avoiding jerky movements.

A dislocated joint can be treated through medication, manipulation, rest or surgery.

(B) FRACTURE

In this injury, bone breaks up by some external pressure. There may be slight breakage or complete breakage. Fracture may be simple or complicated. Incomplete or wrong treatment of fracture is very dangerous, thus to be handled by an expert.

Types of Bone Fractures


Transverse
Linear
Oblique, nondisplaced
Oblique, displaced
Spiral
Greenstick
Comminuted

Symptoms of Fracture :

(*i*) Severe pain around fractured bone.

(*ii*) The bone will look deformed and swelling around the affected part.

(*iii*) The bone will appear fixed with no movement being possible.

(*iv*) Local temperature rises.

(*v*) Fractured part is deformed.

TYPES OF FRACTURES

(*i*) Stress Fracture : A stress fracture is also known as hairline fracture. It is caused by repeated stress over time. It mostly occurs in jumping events. Bone is pressed from corners and it causes partial damage to bone. Treatment consider is Rest, cold therapy ice packs, cold compresses, apply ice to the injured area, anti-inflammatory medications such as ibuprofen, aspirin etc and a recovery time of 6 to 8 weeks is required for healing.

(*ii*) Greenstick (Hairline) Fracture : When bone is bent with mild cracking, the bone does not break completely. Treatment consider is removable splints result in better outcomes than casting.

(*iii*) Comminuted Fracture : Bone is broken up into many small pieces at the site of fracture. Treatment consider an X-ray is important for diagnosing of the condition. An open reduction when the bone fragments are jammed-together using surgical nails, wire plates etc. is required for comminuted fracture.

(*iv*) Transverse Fracture : This type of fracture is caused due to breaking of bone at right angle with the axis of the bone. It can be treated at home along with rest and medicine. A back brace (called TSL) or abdominal binder may be prescribed to reduce the pain by limiting motion at the fracture site.

(*v*) Oblique Fracture : An oblique fracture is that in which the bone breaks diagonally. Oblique fracture tends to occur on longer bones. Treatment depends upon the severity of the crack or break. Anti- inflammatory medication, reduction (Resetting the bone) can also help to some extent.

(*vi*) Impacted Fracture : The broken bone is driven into another broken bone or when the broken ends protrude into other bone or part by sudden impact. In an impacted fracture the bones get broken into fragments. Therefore, a sling or a splint may be required to keep the broken bones in place, so that movement of the sharp ends of the broken bone is prevented. This is essential to prevent further damage to the bone.

Fracture can be categorized as :

(*a*) Closed Fracture : In this fracture, the broken bones remain inside the covering of skin, i.e. there is no open cut over the skin.

(*b*) Open Fracture : In this fracture, there is cut over the skin by the sharp edges of broken bone / bones or by external object along with broken bone / bones.

First aid and Management of Hard or Bone Injuries (Dislocation or Fracture) :

(*i*) Do not move the joint. The victim should be kept at a comfortable position.

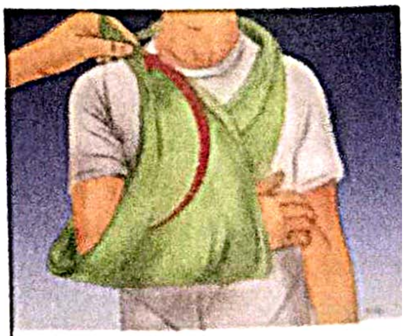
(*ii*) Apply cold pack or ice packs to reduce pain, swelling and internal bleeding.

(*iii*) Provide support by using string or splint bandage or sling to prevent further movement; moreover, it gives relief to victim.

(*iv*) Patient should be handled by an expert doctor and X-ray and other diagnosis should be done properly. The expert should manage immobility by applying plaster so as to enable the joint to take its real position.

(*v*) This immobility should be for 3 to 6 weeks as per expert advice.

(*vi*) After full treatment of the dislocated joint follows the progressive rehabilitation exercises or physiotherapy to regain strength of the joint or bone under the observation of a expert.


Sling Tying

5.(E) FIRST AID AND ITS OBJECTIVES

First aid is the immediate and temporary care given to the victim. The first objective is to save life. This guides us what to do and what not to do which can further help us to avoid injury or damage. First-aid was used by St. John Ambulance Association in 1879.

Objectives of First Aid : There are some general principles of first aid. If these are followed properly, the worst situation of the victim can be avoided up to some extent. These objectives are given below :

(*i*) Immediate Aid : If possible, the first aid should be provided immediately. At this time, we should not think about useless things. Time is very precious at that moment. So, without wasting any time the decision should be taken, so that the life of victim can be saved.

(*ii*) Think about ABC : The person, who provides first aid to the victim, should think about ABC, i.e. Airway, Breathing and Circulation. So, first of all he should check the throat of the victim. He should unbutton the shirt of the victim. Then, he should check his respiration. If victim's respiration is not running well, he should give him Artificial Breathing (AB). After that the person giving first aid should check his blood circulation. For this purpose, he should check his pulse rate. If the pulse is not felt by the first-aider, he should use Cardio-Pulmonary Resuscitation (CPR) technique immediately. In this process, artificial respiration is given and after that chest is pressed for artificial blood circulation. This process must be repeated at least 15 times.

(*iii*) Stop Bleeding : If there is bleeding from any organ of the wounded person, it should be stopped at once. The wounded person's life may be in danger in case of excessive blood loss. If his hand or leg is bleeding, it should be raised up above the heart level. In case of cut on any main artery, it should be kept pressed with thumb or bandage till the arrival of the doctor.

(*iv*) Crowd should be Kept Away : It is usually seen that people gather immediately when there is any accident. They gather in the form of crowd. Every individual wants to see the injured person. In such condition, the injured does not get fresh air and, therefore, the person giving first aid should also try to keep the crowd away from the injured person.

(*v*) Wrap the Injured in Cloth or Blanket : At such time, victim should be kept warm. So, should be wrapped in a cloth or blanket.

(*vi*) Sympathetic Attitude : The person giving first aid should have sympathetic attitude. When an accident happens, the wounded or injured person feels fear and terror. He should be treated politely and sympathetically so that he may come out of his fearful situation. He should also be assured and reassured that nothing serious has happened and he would be all right. The first-aider should not be rash. He should perform his duty with calmness and patience.

(*vii*) Fluids should not be given to the unconscious person : If a person becomes unconscious due to accident, he should not be given any liquid because liquid substance may enter into his wind pipe and that may create further problems.

(*viii*) Medical Aid : The first-aider should call the doctor or expert immediately.

CAUSES OF SPORTS INJURIES

Every sportsperson is prone to accidents or injuries irrespective of preventive steps or physical fitness level. The main cause of accidents or injuries in sports are :

(*i*) Lack of Fitness : Lack or less of physical fitness may cause injury or accident.

(*ii*) Poor Concentration : Poor concentration or lack of mental readiness leads to injuries.

(*iii*) Overstress or Tension : Overstress, tension or unbalanced psychological behaviour is one of the causes of accident.

(iv) Not Performing Warming-up : Not performing proper warming-up before the activity is the main cause of injuries during sports.

(v) Equipment Failure : Equipment fault or failure of equipment can cause accidents in sports.

(vi) Faulty Skill Actions : Player performing faulty skill actions or unbalanced movements while playing or uncoordinated movements causes injury.

(vii) Not Following Rules : Player, not following the rules and regulations of the activity, can cause injury.

(viii) Aggression or Violence : Aggression or violence during game is also the cause of accident or injury.

(ix) Poor Playfield : Poor maintenance of playfield or playfield not as per rules of the game can cause injury.

(x) Not Considering Safety Means : During game if we do not consider the safety means we may get injured.

(xi) Not Wearing Protective Guards : Players not wearing protective guards or not considering the safety equipments is one of the causes of injury.

(xii) Wrong Training Methods : Poor or wrong training methods; overtraining or overexertion of muscles may cause injury.

(xiii) Wrong Treatment of Injury : Player not fully recovered from injury or incomplete treatment of injury or ignoring the previous injury may cause further injury.

PREVENTIVE STEP FROM SPORTS INJURIES

In games and sports, the hundred per cent prevention is never possible but it can be prevented or minimized by considering these steps like :

(i) Proper Warming-up : Proper warming-up (general and specific) is a must for player before participating in any physical activity. It tones-up body muscles and prepares the player psychologically for the coming activity. Thus, it prevents them from accidents or injuries.

(ii) Medical Check before Activity : The proper medical check-up of the players should be done before any physical activity related to previous injury disease, physical fitness level, etc. They must be fit to participate in the activity.

(iii) Proper Concentration : Player should play with full alertness and proper concentration over the activity. Player should not have any stress or tension; moreover, must be mentally ready for the activity.

(iv) Safety Guards and Check Equipments : Player should check his equipments and their condition regularly. Player should use good quality equipments along with safety measures. Player should wear proper dress or kit along with proper shoes (according to surface as per activity needs).

(v) Regular Conditioning and Proper Skill : Regular conditioning improves various abilities of player like proper skill action, develops specific physical components, strengthens weak muscles and joints, etc.

(vi) Sufficient Physical Fitness : For the activities of physical education, player should have sufficient level of physical fitness. Thus, player should develop them through regular conditioning.

(vii) Consider Safety Means : Player should consider safety means, proper training equipments and sufficient free space around the playfield while performing sports activities.

(viii) Proper and Safe Environment : Safe environment prevents accidents whereas unsafe environment may cause accidents or injuries.

(ix) Activity Under Expert's Observation : Player should participate in physical activity under expert's observation like coach, teacher, instructor, trainer, etc.

(x) Good Coaching Skills : Good coaching skill helps to improve sports performance, moreover, it prevents player from accidents or injuries.

(xi) Follow Rules and Regulations : Player should follow rules and regulations of activity with true spirit.

(xii) **Consider Sports Ethics and Sportsmanship :** Player should develop and consider sports ethics and sportsmanship. It improves the social qualities of player, thus friendly attitude of players.

(xiii) **Controlling Aggression and Violence :** Players should control their aggression; moreover, violence during games should be prevented and checked.

(xiv) **Proper Training Methods :** Player should follow proper training methods during practice, whereas overtraining or overexertion of muscles should be avoided during training.

(xv) **Follow Training Principles :** Player should follow training principles in a progressive manner. These principles help in preventing accidents and injuries.

(xvi) **Balanced Diet and Good Posture :** Player should take balanced diet according to activity needs. Moreover, they should maintain good posture.

(xvii) **Knowledge of Health Education and First Aid :** Players should have sufficient knowledge about health education and healthy habits. Moreover, they should be practically trained to give first aid to injured player.

(xviii) **Training Regarding Safe Escape :** Players should be well-trained and guided properly regarding safe escape from disasters or accidents like line movement, knowledge about using fire extinguishers, disaster management techniques, helping the drowning person, etc.

Some Important Questions

Multiple Choice Questions (MCQs)

1. Endurance depends upon :
(*a*) Maximal oxygen uptake   (*b*) White muscle fibers
(*c*) Body weight   (*d*) Joint articulation

2. Speed determining factor is :
(*a*) White muscle fiber   (*b*) Red muscle fiber
(*c*) Cardiovascular endurance   (*d*) Muscle length

(***Compartment 2020***)

3. Cardiac output is the ability to :
(*a*) Breathing with maximum volume of air   (*b*) To pump out blood in one minute
(*c*) No cardiac problem   (*d*) Decrease in blood pressure

4. Cardio-respiratory system improves the :
(*a*) Heart size   (*b*) Lung volume
(*c*) New capillaries   (*d*) All of the above

5. The prime objective of First-aid is to :
(*a*) Take the victim to hospital   (*b*) To provide water and food to victim
(*c*) Immediate and temporary care to save life of victim   (*d*) To call the police

6. Contusion is :
(*a*) Cut over skin   (*b*) Crushing or damage of soft tissues
(*c*) Damage over muscles   (*d*) Displacement of bone

7. The first-aid given to sprain injury is :
(*a*) RICER   (*b*) Following doctors advice
(*c*) Giving massage to affected part   (*d*) Applying muscle ointment

8. The types of fracture :
(*a*) Hairline fracture   (*b*) Stress fracture
(*c*) Oblique fracture   (*d*) All of the above

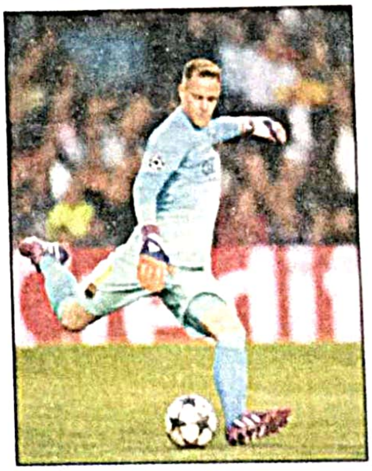
UNIT 8

BIOMECHANICS AND SPORTS

TOPICS & LEARNING OUTCOMES

1. **Newton's Laws of Motion & its application in sports: It will help to understand laws of motion and its applications in sports.**
2. **Types of Levers and their application in Sports : Make students understand the lever and its applications in sports.**
3. **Equilibrium – Dynamic & Static and Centre of Gravity and its application in sports: It will give understanding of equilibrium; CG and its role in sports.**
4. **Friction & Sports : This topic will help to gain knowledge about friction and its role in sports.**
5. **Projectile in Sports: In this we gain knowledge about Projectile and its importance in sports.**

1. NEWTON'S LAWS OF MOTION AND ITS APPLICATION IN SPORTS



These laws of motion were **formulated by Isaac Newton in 1687,** thus also known as **"Newton's Laws of Motion".** He explained and investigated that every motion is under the impact of these laws of motion. There are three laws of motion which are explained as under.

As man is said to be man of action, thus movements are involved everywhere. For every movement there is motion. Thus, everything that moves is governed by 'Laws of Motion.'

(A) LAW OF INERTIA (FIRST LAW OF MOTION)

This law states that an object at rest will remains at rest or in motion will remains in motion at a constant velocity unless acted upon by an external force. According to this an object will not move or remains at stationary position unless force is applied.

Example : A football placed at penalty point will remains at rest unless a player kicks the ball (force applied) to move the ball towards goal-post. It will move in the direction where the player had exerted the force through kick.

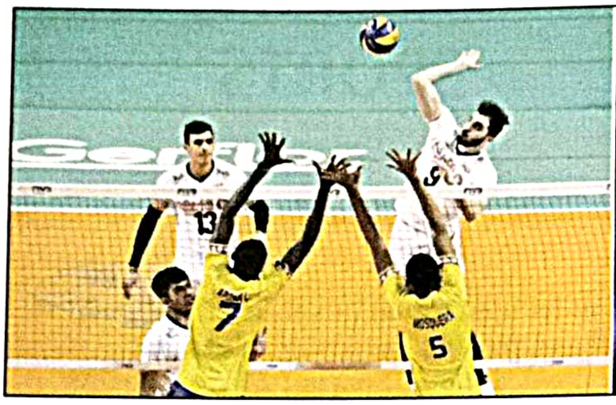
(B) LAW OF ACCELERATION (SECOND LAW OF MOTION)

It is also named as Law of Momentum. According to this law of motion; the rate of change in velocity (acceleration) of an object is directly proportional to the force applied and inversely proportional to the mass of body. The greater the force applied, the faster is the velocity and more is displacement and if force applied is less, then the displacement is less, moreover, the acceleration is also less.

Its formula is Force = mass × acceleration.

If unequal forces are applied to objects of equal masses, the greater force will cause more acceleration. If equal forces are applied to objects of unequal masses, the object with greater mass will have less acceleration.

Example 1 : A volleyball player pushes the ball slowly for a drop whereas hits the ball hard for a smash. Thus drop is slow as there is less force whereas smash is very fast as there is great force applied.



USA
TDK
KOVACS

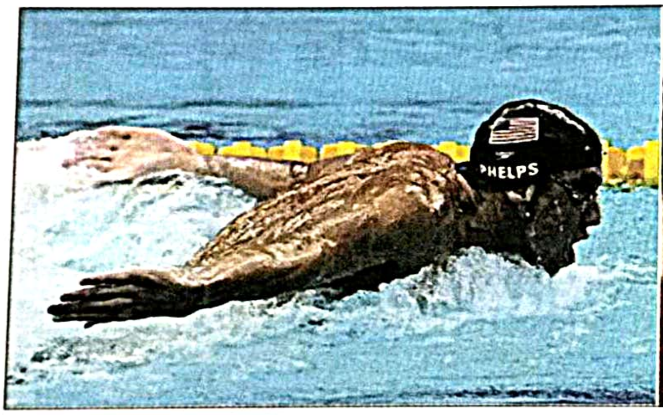
Example 2 : In a shotput event, a player who exerts more force and tosses the shotput at correct angle has greater displacement of shotput, whereas a player who exerts less force has lesser displacement of shotput.

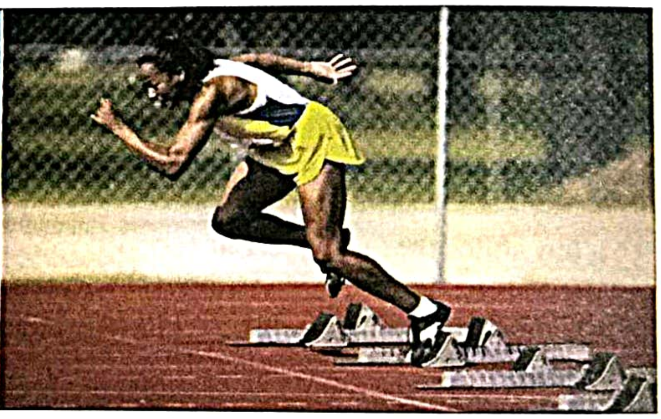
(C) LAW OF ACTION AND REACTION (THIRD LAW OF MOTION)

This law of motion states that for every action there is equal and opposite reaction.

Example 1 : In swimming, when the player pushes the water backward, in return he gets a forward push.

Example 2 : An athlete pushes the starting block backward, in result athlete is pushed forward.



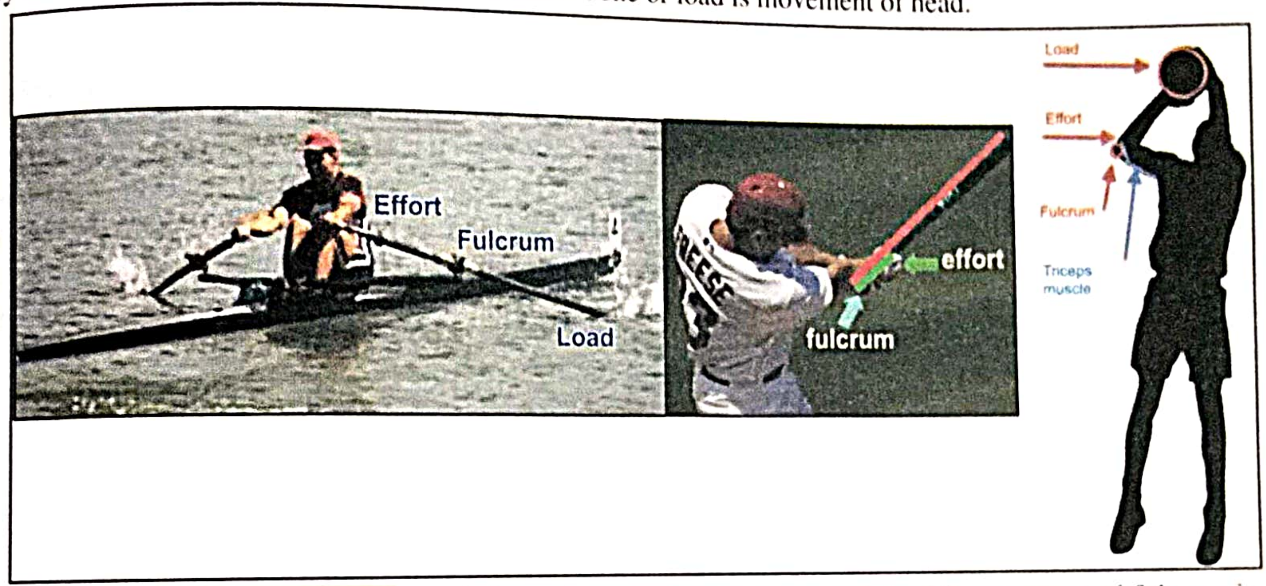


2. TYPES OF LEVERS AND THEIR APPLICATION IN SPORTS

Lever is a simple machine that makes work easier. It involves moving a load or work around a pivot (fulcrum) using force. It consists of a beam or rigid rod or bar pivoted at fixed point (fulcrum). Many of our basic tools use lever like scissors, plier, nut cracker, pulley, tongs, see-saw etc. Levers are also found in body (skeletal system) by which our actions, movements are done. In our body joints act as Fulcrum (pivot). Effort is done by muscles by their contraction and it provides or exerts force. The movement of body part or action becomes the work done or load. Levers are of three types/classes :

First Class/Type Lever : In this type of lever effort is at one end, fulcrum is at centre and load or work done is at the other end.

Example : Head Movement : In this the fulcrum is at top vertebrate (Skull and Neck joint). Effort is done by contraction of neck muscles and thus the work done or load is movement of head.

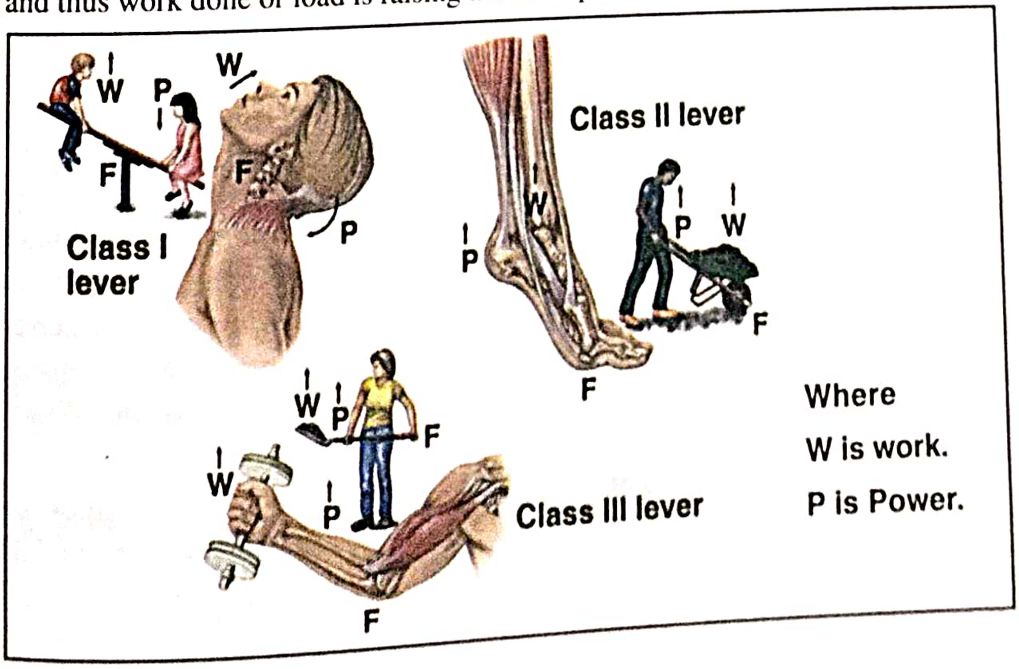

Effort
Fulcrum
Load
effort
fulcrum
Load
Effort
Fulcrum
Triceps muscle

Second Class/Type Lever : In this lever the effort arm is at one end, load is at centre and fulcrum is at other end.

Example : Standing on Toes Tips : In this toes act as fulcrum. Muscles pull the heel up and thus the work done or load is at centre which pulls the body up or raises the body upon toes.

Third Class / Type Lever : In this type of lever load is at one end. Effort is done at centre and fulcrum is at other end.

Example : Bending the Arm : In this type elbow joint acts as fulcrum. Effort is done at centre by bicep muscles and thus work done or load is raising the arm up or bends the arm.


W
P
F
W
F
P
Class I lever
Class II lever
W
P
P
W
F
F
W
P
F
W
P
F
Class III lever
Where
W is work.
P is Power.

PRINCIPLES OF LEVER

(*i*) Longer the power or effort arm of lever, the greater the movement (torque) of force.

(*ii*) Shorter the power or effort arm as against the load/weight arm, the smaller the movement of force but immediate and faster the action.

(*iii*) Linear velocity of lever is proportional to radii, *i.e.* longer the radii, more speed and range at ends.

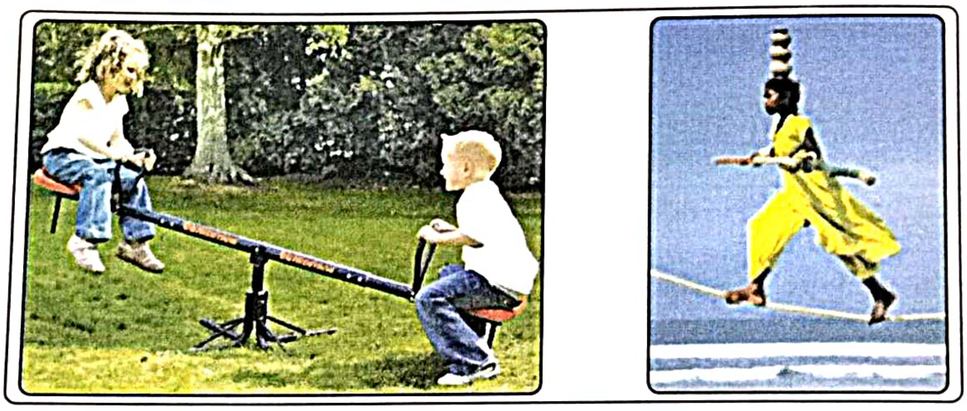
(*iv*) To turn the object, the force must be exerted at a distance to its axis. The greater the distance of power or effort arm the greater will be the turning effect.

(*v*) For more effective force it must be directed at right angle.

(*vi*) For speed and range third class/type levers are best. First class/type levers are used for heavy resistance. Second class/type levers are good for putting thrusting force.

3.(A) EQUILIBRIUM

Equilibrium is a condition in which forces cancel one another. It is also known as Balance. In other words, it is a condition in which influences are cancelled by others; resulting a stable, balance or unchanging system. In this the resultant of all forces acting on it is zero. Equilibrium provides us balance and stability. Equilibrium is generally more scientific in nature while 'balance' can be used idiomatically to describe power, flavour or anything abstract. Balance is ability to control equilibrium. In sports balance is the ability to stay upright or stay in control of body movement.

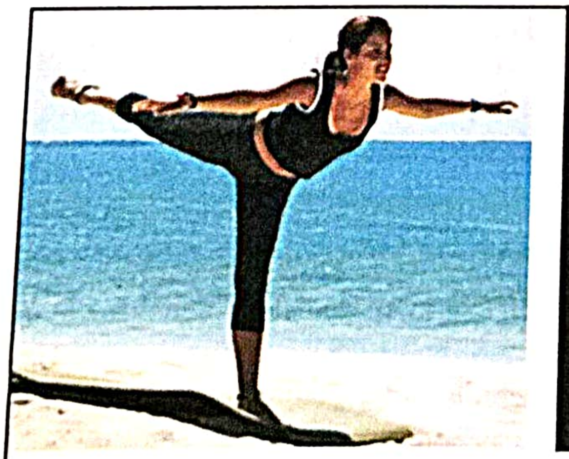


STATIC EQUILIBRIUM / BALANCE

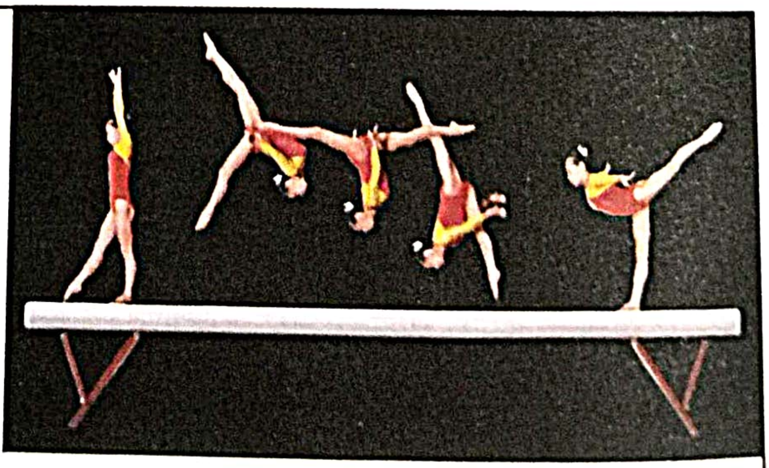
It is a state where body is at rest or motionless like standing on one leg. In other words 'Static Equilibrium' refers to the physical state in which body is at rest and the net force is zero. It take place when all the forces acting on the object are balanced and the object is not in motion.

DYNAMIC EQUILIBRIUM

Dynamic Equilibrium is that when an object moves at constant speed and all the forces of the object are balanced. All applied and inertial forces acting on the moving body are in balance, resulting in movement with unchanging speed or direction. Dynamic equilibrium occurs when a horizontal force is applied to an object causing it to move with a constant speed across a horizontal surface. To control equilibrium and achieve balance, stability needs to be maximized. It is a state where body is in motion with unchanged acceleration created by applied or inertial forces like walking or running small base.



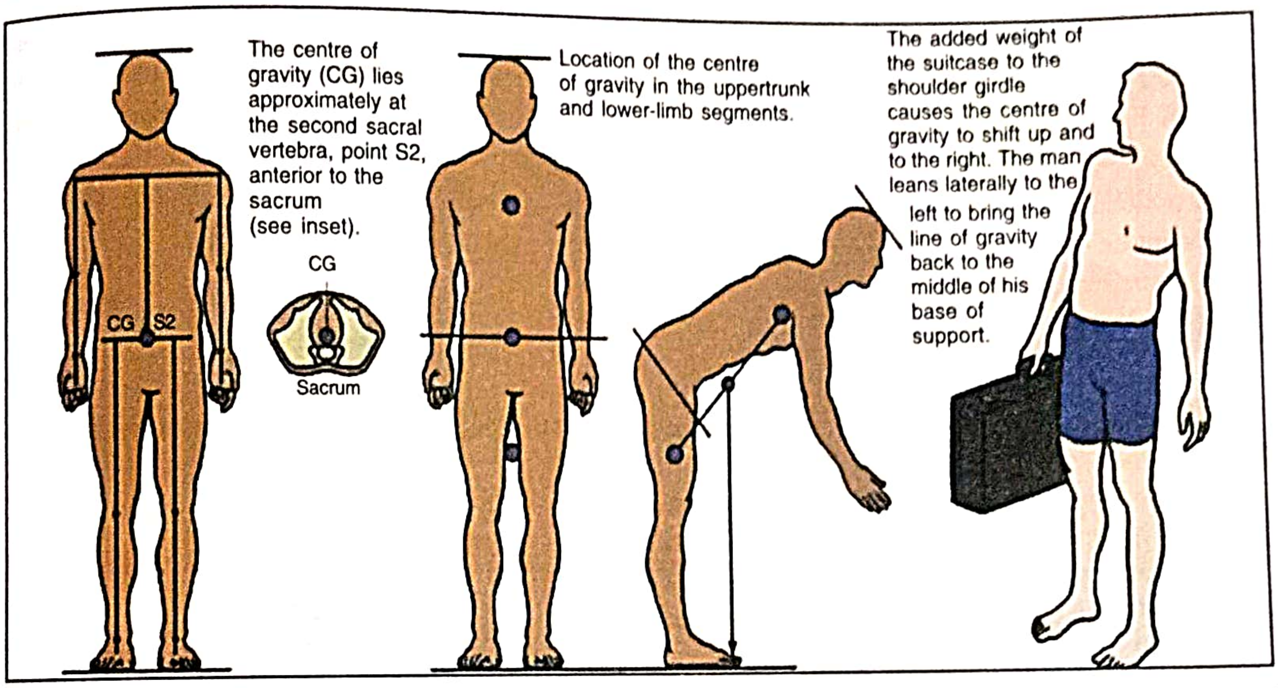
Static Equilibrium/Balance



Dynamic Equilibrium/Balance

3.(B) CENTRE OF GRAVITY (CG) AND ITS APPLICATION

Balance and stability depends upon Centre of Gravity (CG). It is ability to maintain the line of gravity of body within the base of support and minimal postural away. The scene of body balance of an individual is located in our inner ear (vestibular). The ability to balance, whether stationary or moving (dynamic), is a key to success in most of sports and physical activities.



The centre of gravity (CG) lies approximately at the second sacral vertebra, point S2, anterior to the sacrum (see inset).

Location of the centre of gravity in the uppertrunk and lower-limb segments.

The added weight of the suitcase to the shoulder girdle causes the centre of gravity to shift up and to the right. The man leans laterally to the left to bring the line of gravity back to the middle of his base of support.

Stability of an athlete depends upon the Centre of Gravity (CG). It is exactly in the middle of body around which it can rotate freely in any direction and where the weight of body is centred. It is exactly at the point along the midline of body (near the navel point).

Example 1. In wrestling, the down player lies down or bends down, i.e. lowers his centre of gravity (CG) by expanding legs and hands to increase the stability.

Example 2. In weightlifting, player widens his base by keeping feet apart which provides more stability and balance.

Example 3. During landing, player bends his legs which provides fast control of stability, moreover, it reduces injury from impact.

3.(C) PRINCIPLES OF STABILITY AND BALANCE

***(i)* Centre of Gravity within the Base of Support** : To remain in balanced and stable position, the Centre of Gravity (CG) should be within the base of support.

***(ii)* Widen the Base of Support** : To increase stability, widen the base of support. Wider the base, more stable is the object.

***(iii)* Lower the CG** : For more stable position, the Centre of Gravity should be lowered down.

***(iv)* Expand the Base of Support** : For increasing the stability expand the base of support.

***(v)* Increase Friction between Supporting Surface** : The greater the friction between supporting surface and body, the greater is balance.

***(vi)* Increased Mass** : Higher the mass/weight, the more is stability whereas the lesser mass/weight has less stability.

***(vii)* Push or Pull Close to Base of Support** : During push or pull the object should be close to base of support to be more stable.

***(viii)* Proper Catching Technique** : During catch unstable position may arise, thus, proper catching technique should be known to receive impetus/force.

(ix) Proper Falling Technique : Proper falling techniques should be known to player otherwise injuries may arise due to unstable position.

(x) Rotation about Axis : Players should be aware of rotation about axis as it provides easy balance like it is easy to balance a moving cycle than stationary cycle.

4. FRICTION AND SPORTS

Friction is resistance to forward motion. It is the force resisting the relative motion of solid surface, fluid layers and material elements sliding against each other. It creates obstruction to moving objects. Friction is a force that is created whenever two surfaces move or try to move across each other. Friction always opposes the motion or attempted motion of one surface across another surface.

Friction force depends upon the nature of surface of contact and material or object in contact. Friction is dependent on the texture of both surfaces. Friction is also dependent on the amount of contact force pushing the two surfaces together.

(A) TYPES OF FRICTION

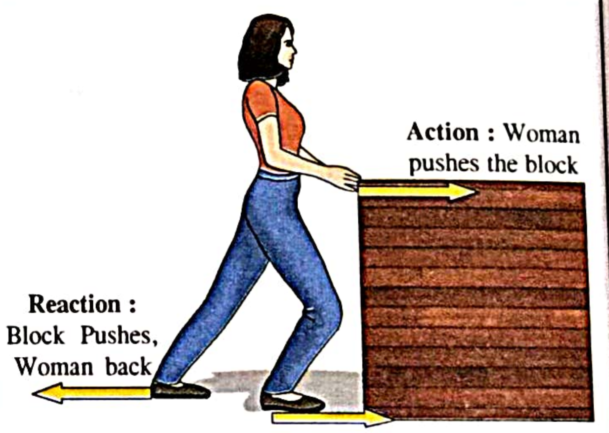
There are various types of friction such as :

(i) Static Friction : Static friction is between two or more solid objects that are not moving relative to each other. Static friction acts on an object when it is resting on a surface. It comes into play when a body is forced to move along a surface but movement does not start. Without this static friction, your feet would slip out and it makes difficult to walk. It prevents objects from sliding down on slope surface.

(ii) Dynamic / Kinetic Friction : It occurs when two objects are moving relative to each other and rub together. It is of two types :

(a) Sliding Friction : It is the friction which acts on the object when it slides or rub over the surface. It is weaker than static friction. Sliding friction causes wear and tear.

(b) Rolling Friction : Rolling friction is a force that slows down the motion of a rolling object. It acts on objects when they are rolling over a surface. It is much weaker than sliding friction. Basically it is combination of various types of frictional forces. e.g., a point of contact of wheel and ground or surface.


Action : Woman pushes the block
Reaction : Block Pushes, Woman back

Static Friction : Between Shoes and Floor

(B) ADVANTAGES AND DISADVANTAGES OF FRICTION

The advantages and disadvantages of friction force depend upon the situation.

(i) Helps to Move : Friction force helps to move the object by friction. It helps in running, walking with friction of feet / shoes on surface.

(ii) Stops the Moving Object : It helps to stop the moving object.

(iii) Hold or Grip an Object : With the help of friction the ridges of skin on our fingers and palm enable us to grasp and hold objects.

(iv) Makes Movement Difficult : Any time you want to move an object, friction can make the job more difficult. Excess friction can make it difficult to slide a box across the floor, walk through deep snow.

(v) Waste of Energy : Excess friction means extra energy, to overcome from friction we have to apply more force or energy thus, energy is being wasted because of friction.

(vi) Wear and Tear of Objects : Due to friction there is wear and tear of objects. Lubrication is used to allow parts to move easier.

(vii) Keeps the Objects at Position : By friction, the objects can be placed at position.

(C) ROLE OF FRICTIONAL FORCE IN SPORTS

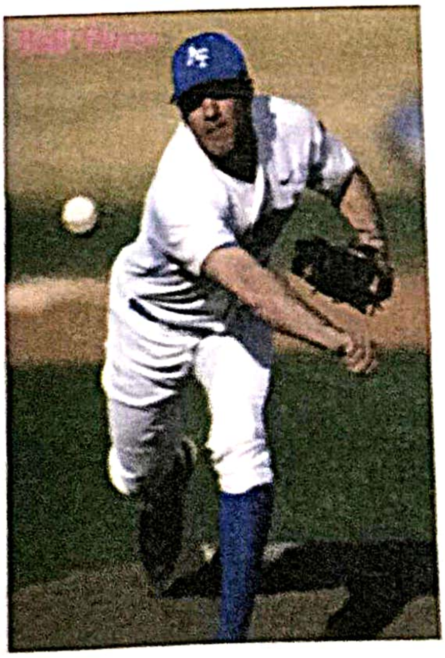
Friction is an important force in every sport activity and it is the deriving force for most of actions in sports. Locomotion requires frictional force that's why the shoes we wear are specially designed to provide proper frictional force between our feet and the supporting surface.

In most of sports activities the players' shoes like (Jogger for normal playfield; spikes in athletics; studs in football; cricket shoes in cricket; hockey shoes in hockey, badminton shoes in badminton, etc.) provide large frictional force for gripping over surface. They have specialized soles designed to providing large coefficient of friction. Thus, good movement of player on the playfield depends upon the types of shoes. **Frictional force is also required for pulling and pushing which is common in most of the sports activities. Friction is also required for gripping,** thus grip tapes are also used in cricket bat, hockey stick, badminton racket, tennis racket, etc.

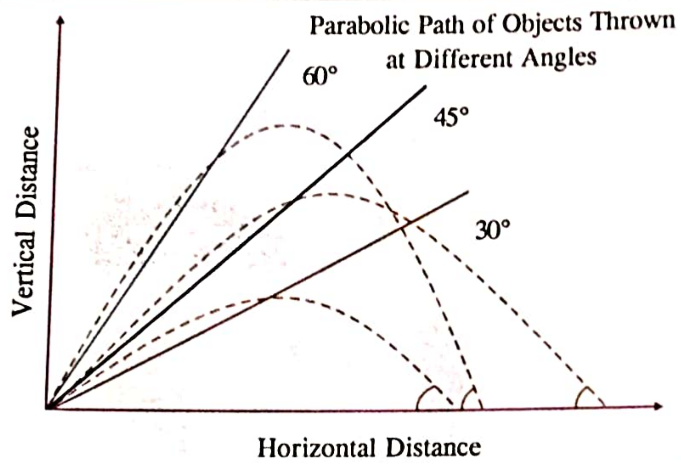
5.(A) PROJECTILE IN SPORTS

Any object which is thrown in space and travels under the influence of gravity, air resistance and other forces is called projectile. Projectile is a motion in which an object is thrown or launched into air in a distinct path which looks like a curve. The path through which the projectile passes is called trajectory or parabola. In projectile, the angle of release is equal to angle of fall and it follows the parabolic path. Both the halves have equal areas. There are forces which act upon projectile and influence the parabolic path are :

(*a*) Gravity (*b*) Air Resistance (*c*) Initial Velocity



The objects thrown on various angles will cover less distance but if the object is thrown at 45° angle it will cover maximum distance. Thus, 45° angle is the best angle of release to dispatch the projectile to the longest distance.



The distance of projectile depends upon the speed and force applied on it. The resistance of air also affects the objects which are lighter in weight. For example, a shuttlecock does not travel longer distance due to air resistance. Spin of object also affects the parabolic path or the speed of object or distance of parabolic path. The distance of projectile also depends upon the initial velocity of the projectile. If the velocity is less, the distance covered will be less, conversely if the initial velocity is more, the distance covered will be more. Projectile in sports includes objects and athletes in flight as a result of throwing, batting, kicking and jumping.

5.(B) FACTORS AFFECTING PROJECTILE

***(i)* Air Resistance** : As a projectile moves through the air it is slowed down by air resistance. Air resistance will decrease the horizontal component of a projectile. The effect of air resistance is very small but needs to consider surface area, volume ratio, speed of object and mass. For example, a badminton shuttle will have much more air resistance than a golf ball.

***(ii)* Gravity** : Gravity acts on a body or object to give it mass. The greater the weight of an object, the greater the influence of gravity upon it. Gravity will affect a projectile as well as it will decrease the height the projectile can obtain. For example, a cricket ball can be thrown to greater distance as compared to shot put (in Athletics).

***(iii)* Speed of Release or Intial Velocity** : The speed or velocity is directly related to distance covered in flight. The speed of release depends upon (a) Initial vertical velocity (b) Initial horizontal velocity. Having higher initial horizontal velocity will increase the length of the flight time and, therefore, the distance covered. This would be an advantage in sports which primarily requires good distance, such as long jump, ski jumping, vaulting in gymnastics, etc.

***(iv)* Angle of Release** : The angle of release changes the relationship between the horizontal and vertical components of the projectile. The ideal angle of release is 45 degree. A golfer hitting a ball from the top of hill would hit it further than a golfer at ground level. The ball will stay in air for longer time so it will have greater chance to gain distance.

***(v)* Height of Release** : The higher the level of release, the greater the distance covered in flight. This is because the higher the projectile is released, the longer it will be in the air. Horizontal component will be acting on the projectile for longer.

***(vi)* Spin** : The amount and direction of spin acting on a projectile will directly affect the distance projectile will travel. In tennis shot, topspin gives less distance as compared to backspin.

UNIT 9

PSYCHOLOGY AND SPORTS

TOPICS & LEARNING OUTCOMES

1. **Personality; its definition & types (Jung's Classification & Big Five Theory): This topic help to understand Personality; its classifications; special emphasis according to Jung's and Big Five Theory.**
2. **Motivation, its types and techniques : To make students understand motivation and its techniques.**
3. **Exercise Adherence: Reasons, Benefits and Strategies for Enhancing it : To make students familiar about Exercise Adherence and Strategies for enhancing Adherence to Exercise.**
4. **Meaning, Concept & Types of Aggressions in Sports: It will help to understand Aggression, its causes; its types; factors affecting Aggression; and Aggression management Techniques.**
5. **Psychological Attributes in Sports – Self Esteem, Mental Imagery, Self Talk, Goal Setting : This topic explains how games and sports helps us in boosting psychological factors.**

1.(A) PERSONALITY (MEANING AND DEFINITION)

Personality is the typical pattern of thinking, feeling and behaviour that make a person unique. Personality is defined as the enduring personal characteristics of individuals.

In other words, Personality is the combination of characteristics or qualities that an individual distinctly possesses. Personality usually means that an individual is much more than his outer appearance.

According to Sigmund Freud, "Personality is an individual's unique pattern of traits."

According to Begge & Hund, "Personality refer to the whole behavioural pattern of an individual to the totality of its characteristics."

According to Carl Jung, "Personality is an attitude refers to a predisposition to behave in a certain manner."

Personality includes the combination of emotional, attitude and behaviour response pattern of the individual. Personality is the aggregate decision made throughout the life and the memory of the experiences which led to these decisions. It usually remains consistent throughout life.

Personality type refers to the psychological classification of different types of people. Personality types are distinguished from personality traits, which come in different degrees. There are many theories regarding personality types, and each theory contains several and sometimes many sub theories.

In ancient Indian Vedas, personality is categorized in three parts *i.e.,* Sattva guna, Rajas guna & Tamasic guna. The *Sattva Guna* consists of qualities related to "spirituality". When *Sattva Guna* is dominant, a person has an inherent desire to be good and caring. Cleanliness, truthfulness, discipline, constructive thought and self-control are the motive force of *sattvic* action. *Rajas Guna* gives rise to passion and desire. Such a person veers towards greed activity, undertaking of works, restlessness, gratifications, dissatisfactions, and envy. A person who is *Tamasic* possesses characteristics associated with laziness, inactivity, destructive behaviour, arrogance, anger etc.

In modern times, there are various theories regarding personality. Trait refers to a unique and stable characteristic that is unchanging and predictable.

GENERAL PERSONALITY TRAITS OR DIMENSIONS

(i) Physical Dimension or Traits : It is related with the appearance, shape, size, structure, weight, height, skin colour, etc.

(ii) Psychological or Mental Dimensions or Traits : It is related with behaviour, thoughts, ideas, knowledge, etc.

(iii) Social Dimensions or Traits : It is related with social qualities like adjustment, cooperation, togetherness, discipline, leadership, etc. Carl Jung's classification is based on the social dimensions.

(iv) Emotional Dimensions or Traits : It is related with behaviour, attitude, interest, anger, happy, joyfulness, curiosity, etc. The most appropriate theory of extraversion behaviour deals with such traits.

1.(B) TYPES OF PERSONALITY

(A) JUNG'S PERSONALITY CLASSIFICATION (SOCIAL TRAITS THEORY)

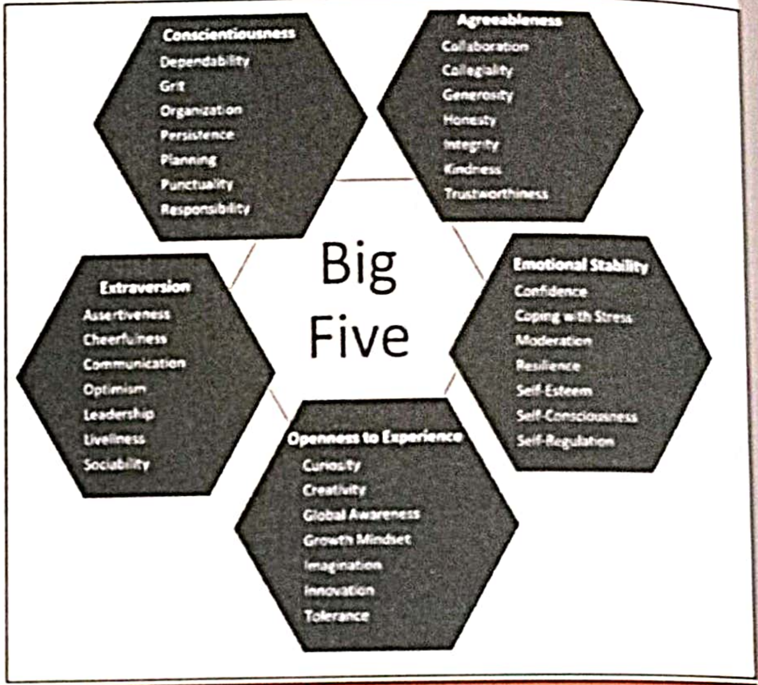
Carl Jung's Classification is based on the social dimensions. According to him, Personality has the following basic types : (*i*) Introvert Personality (*ii*) Extrovert Personality (*iii*) Ambivert Personality.

Jung's Personality Dimension	Characteristics
Introvert Personality	**Introverts are described as people who share characteristics such as shyness, social withdrawal, tendency to talk less. They are typically seen as more reserved or reflective and prefer to be withdrawn from external reality.** They opt to live in their own inner world of feelings and thoughts and often take pleasure in solitary activities such as reading, writing, or meditating. They have their own internal world of ideas, thoughts, behaviour, interest and attitude. Introvert people are self centred, unable to adjust easily in social situations. They are not easily suggestible. They are future oriented, very sensible and rigid in ideas.
Extrovert Personality	**They prefer the outer world of things, hence are found to be more broad-minded and are highly socialized, hence can meet unknown people easily. They are very bold, outgoing and optimistic persons. These persons have the tendency to be outgoing, friendly, talkative and social in nature.** Their behaviour and actions are concerned to interact with others. They prefer contacts, are generous, supportive and courageous. Extrovert persons interact with the external world. They show interest in present rather than the future. They express their feeling openly and take decisions quickly and act upon quickly. They are not affected easily by difficulties.
Ambivert Personality	**There is reference of a third term called Ambivert which is a relatively new term. Jung did not use any word to explain that there is no such thing as a pure introvert or extrovert.** This concept was later supported by many other psychologists. **Ambiverts reflect a blend of traits from the introvert as well as the extrovert along with having some specific strength. Thus, an ambivert can be defined as someone who falls in the middle of the introvert and extrovert personality type.** An ambivert is moderately comfortable with groups and social interaction, but also relishes time alone, stay away from a crowd. In simpler words, an ambivert is a person whose behaviour changes according to the situation.

(B) BIG FIVE PERSONALITY CLASSIFICATION (EMOTIONAL TRAITS THEORY)

Big Five Personality model was given by Paul Costa and Robert McCrae.

According to Big Five Theory, the personality depends upon five dimensions or traits referred as **"OCEAN"**.


Big Five
Conscientiousness
Dependability
Grit
Organization
Persistence
Planning
Punctuality
Responsibility
Agreeableness
Collaboration
Collegiality
Generosity
Honesty
Integrity
Kindness
Trustworthiness
Extraversion
Assertiveness
Cheerfulness
Communication
Optimism
Leadership
Liveliness
Sociability
Emotional Stability
Confidence
Coping with Stress
Moderation
Resilience
Self-Esteem
Self-Consciousness
Self-Regulation
Openness to Experience
Curiosity
Creativity
Global Awareness
Growth Mindset
Imagination
Innovation
Tolerance

Big Five Dimension	Emotional Characteristics	Other Characteristics
Openness to Experience **'O'**	Appreciate art; express high emotions; perform adventurous activities; unusual ideas; curiosity; creativity, global awareness; imagination; innovation; variety of experience.	Openness reflects the degree of intellectual curiosity and creativity.
Conscientiousness **'C'**	Have the tendency to show self-discipline, act dutifully and aim for achievement; their behaviour is planned rather than spontaneous. They are dependable, precise, good planner, responsible, well-organized, careful, hardworking and dependable.	Individuals at one end being relaxed and easy going, spontaneous, disorganized and careless.
Extroversion **'E'**	Have high energy, positive emotions, assertiveness, sociability and tendency to seek stimulations in the company of others and talkativeness.	Are cheerful, have good communication skills, leadership and good social qualities.
Agreeableness **'A'**	Are compassionate, cooperative towards others, helpful in nature, trust others. They are collaborative, generous, honest, kind and trustworthy.	It is also a measure of a person's helpful and friendly behaviour nature. It reflects whether that person is really friendly and nurturing or not.
Neuroticism or Emotional Stable **'N'**	Have the tendency to experience unpleasant emotions, often found to demonstrate impulsive and hostile behaviour. These people have high confidence, adjustable, coping with stress, moderate, realistic, self esteem, self conscious etc.	These people have the tendency to experience unpleasant emotions, sadness, nervousness, anxious and excitable at the other etc. In contrast, people who score low in neuroticism tend to be calm and even-tempered.

2.(A) MEANING OF MOTIVATION

The word 'Motivation' is derived from latin word 'Mover' which means 'to change or to move'. Thus, motivation is referred as to change inner urge to achieve the goal. Motivation is also called as "Drive to Stive." Motivation is a kind of inner force which energizes the person to make constant effort. In other words, motivation is the condition which increases the desire to perform better. Motivation is one of the most important areas of psychology. Motivation has immense effect on learning. In the absence of motivation the learning rate is slower.

According to Goods, "Motivation is a process of arousing, sustaining and regulating the activity."

According to Murray, "Motivation is an internal factor that arouses, directs and integrates a person's behaviour."

According to Crooks, "Motivation is any condition that might energies and directs our actions."

Thus, motivation is a process by which individual gets inspired, stimulated, guided and directed properly towards high achievements. Motivation is directly related with better performance. In our everyday life, we use many types of motivational terms like desires, wish, aim, urges, etc. Motivational process regulates the behaviour of a person. It is extremely complex and difficult to understand, interpret, predict and control.

2.(B) TYPES OF MOTIVATION

Motivation is of two types : (*a*) Intrinsic or Internal Motivation (*b*) Extrinsic or External Motivation.

(a) Intrinsic or Internal Motivation : This motivation is within an individual and guides individual to perform better to satisfy one's own personal feelings. Internal motivation depends upon the basic needs or urges of the body, mind and social. Internal motivation gives satisfaction, enjoyment, pleasure, Methods for internal motivation consists of praise, honour, competition spirit, self-learning, self-zeal, gaining knowledge, positive social bonding etc.

(b) Extrinsic or External Motivation : This motivation depends upon external factors like environmental and materialistic things. External motivation has great impact on an individual's performance like prize, rewards, punishment, cash, material things, trophies, medals, equipments, surroundings, teaching methods, teacher-pupil relationship, audio-visual aids etc. Extrinsic motivation is that in which the source of satisfaction does not come from within and the behaviour is not due to natural urges.

Difference between Intrinsic and Extrinsic Motivation

	Intrinsic Motivation	Extrinsic Motivation
Definition	Driving force to pursue an action for fun, joy or any other inner satisfaction.	Driving force to pursue an action due to reward, trophy, money, promotions or praise.
Factors	Internal factors like joy, pleasure, enjoyment.	External factors like reward, promotion, praise.
Methods	Goal setting strategies, family and community support like praise, honour, competition spirit, self-learning, self-zeal, gaining knowledge, positive social bonding etc.	Associating success with future benefits, awards, promotions, avenues, material things, trophies, medals, equipments, surroundings, teaching methods, teacher-pupil relationship, audio-visual aids etc.
Benefits	Long term benefit of maintaining a good behaviour.	Helpful to initiate or create a drive towards a desired behaviour when internal factors are missing.

2.(C) MOTIVATION TECHNIQUES

Motivational factors play a very important role on the performance of a sportsperson. By using motivational factors, a high level of performance can be achieved in sports. Thus, it may bring good winning results. Motivation factors in sports are as follows :

(i) Develops Good Health : The good health of a player is always a motivating factor. The expert have to set proper goal for the person. It encourages person to participate to optimum level in sports activities.

(ii) Providing Healthy Environment : Healthy, clean and hygienic environment motivates the person to participate to maximum level.

(iii) Good Sports Infrastructure and Equipments : Good infrastructure, quality apparatus or equipments and good playfields motivate person to participate in physical activity.

(iv) Giving Knowledge : Gives knowledge, information about the activity and its benefit helps to develop intrinsic motivation, thus helps to improve further.

(v) Fun and Value Based Activity : Fun and value based activities give enjoyment and pleasure, moreover, they refresh, recreate and reenergize to do more. Such activities develop interest and daily life skills.

(vi) Reward and Prize : Rewards and Prizes motivate the sportsperson to give his best, because he knows that if he do better he will get the mentioned reward or prize. So rewards and prizes can make the performace better.

(vii) Good Coaching and Guidance : Coaching and guidance during activity has an important role in performance. Good coaching skills improve the performance.

(viii) Individualized Training Care : The person should be given individualized training care and specific training programme, it will motivates the person to perform better.

(ix) Sufficient Practice : If a person is aware about how much to perform or how to do that activity, then the performance can be much better. This can only be achieved if the player had performed sufficient practice in the past.

(x) Social Support of Spectators : Good and positive response of the spectators encourages the person towards better performance.

(xi) Interaction between Teammates : A healthy interaction between own teammates improves the performance during competition, moreover, team work, collective effort, leadership quality motivates to perform better.

(xii) Healthy Competition : A healthy and good sports competition is a motivating factor for improving performance. Good organization, proper officiating, good judgement etc. encourage person to improve further.

(xiii) Considering Safety Means : Proper safety means help the players to perform to their optimum level, thus performance improved.

(xiv) Punishment or Fine : Punishment and fine can also improve the performance of a person. To stay away from punishment or fine person will give his best because he knows if he will do wrong things he might get punishment.

(xv) Healthy Teacher-Pupil Relationship : A healthy relationship between teacher and pupil improves learning, thus, performance improves.

3.(A) EXERCISE ADHERENCE

Adherence is an attachment or commitment to a person, cause or belief. Adherence refers to maintaining an exercise regimen for a prolonged period of time following the initial adoption phase. Exercise adherence has been defined as exercise behaviour within a structured programme or exercise maintenance outside of a formal programme. Thus, in the simplest term, exercise adherence refers to the extent to which the individual maintains an active involvement in any physical exercise and acts in accordance with the advised interval, exercise dose or exercise dosing regimen despite opportunities and pressures to withdraw.

Purposeful exercise and regular participation in physical activity are among the most important components of lifestyle, especially for older persons. Regular physical activity in the lifestyle is considered as an important behaviour that may yield benefits especially for maintaining physical and psychological well-being.

3.(B) REASONS TO EXERCISE AND BENEFITS OF EXERCISE (PSYCHOLOGICAL)

We often hear about the physical benefits of exercise (like improved strength, heart efficiency etc.); less often are the psychological benefits promoted. Yet engaging in moderate amount of physical activity will result in improved mood and emotional states. Exercise promotes psychological well-being as well as improves quality of life. The following are same common psychological benefits gained through exercise :

(i) Health Benefit : Today people across the world desire to lead a healthy life and consider health as the most essential aspect of life. Modern lifestyle has given rise to many health issues associated with weight management and cardiovascular diseases, for which engaging in physical activity and exercise is essential. People who exercise regularly have a lower risk of developing many long-term (chronic) conditions, such as heart disease, type-II diabetes, stroke, and some cancers. Physical activity can also boost self-esteem, refreshes mood, improves sleep quality and energy, as well as reducing your risk of stress, depression, dementia and Alzheimer's disease.

(ii) Happy Mood : Exercise helps to bring happy and cheerful mood, thus person gains encouragement to do more along-with enjoyment.

(iii) Reduces Stress : Exercises help to reduce stress as well as develop ability to cope with stress. Physical activity, recreational sports and exercise are effective coping strategies for relief from stress and disorders from everyday life. Yoga and aerobic exercise help in combating stress.

(iv) Improves Self-Esteem : Exercises help to improve self-esteem and the person gains confidence. Self-efficacy is the belief that one is capable of achieving a specific goal.

(v) Satisfaction : Exercises help to gain satisfaction factor, so that mind and thoughts remain stable.

(vi) Improves Body Image : Exercises develop good and healthy body image, thus improve personality.

(vii) High Energy : It provides the feeling of high energy, thus person feels active.

(viii) Positive Attitude : It develops positive attitude towards all, thus improves behaviour.

(ix) Stabilise Emotions : It helps to control emotions and anxiety; moreover, stabilizes and expresses them in better way.

(x) Overcoming Depression : Exercise helps to overcome depression and brings up a cheerful life.

(xi) Improves Social Relations : Exercise helps to build good social relationship, moreover, social qualities improves. Group cohesion among participants of exercise group and sporting members acts as one of the important reasons for exercise. It prevent boredom and social isolation by helping participants feel connected with the society and community.

(xii) Cognitive Benefits : Regular aerobic activities lead to a positive improvement in attention control and information processing speed. Exercise can improve brain function and protect memory and thinking skills.

(xiii) Psychological Well-being : Participation in regular sports and exercise brings positive changes in the mental and physical well-being of an individual. Exercise leads to change in blood flow to brain, increase in oxygen consumption, reduction in muscular tension, improve metabolism, create a feeling of well being.

(xiv) Develops Leadership Qualities : Engagement in an exercise programme and participation in sports provides opportunity for individuals to experience adversities and opportunities to learn from compensating various deficiencies like lack of space, inadequate logistics, adverse conditions and still persist with prolonged activities, hence helps in developing qualities of leadership.

3.(C) STRATEGIES FOR ENHANCING ADHERENCE TO EXERCISE

(i) Educating about the Benefits of Exercise : The first step is educating everybody about the benefits of exercising and the need to increase the level of physical activity for long-term weight control. It is important that you should seek information about the benefits of exercise, proper exercise techniques and the results from the experts that should be expected during exercise.

(ii) Enhance the Motivation to Change : Motivational enhancement approaches, cognitive behaviour therapy adopts key principles to enhance the motivation to address behavioural changes.

(iii) Realistic Goal Setting : This strategy has been widely used to identify document and monitor goals related to physiological changes and physical activity behaviour. Your goals should be realistic, specific, measurable and over the short term.

(iv) Health Risk Appraisals : Health risk appraisals provide you with relevant information about your current health, risk factors and level of fitness. This helps to enhance motivation and can be used to monitor changes over time. It can also help with regard to the goal setting process as you identify areas that need to improve.

(v) Self-Monitoring : This involves documenting your activity behaviour, the data collected often includes; date, time of exercise, duration, type of exercise, type of activity, heart rate. Sharing this document with a group leader or another participant will help to build some accountability and facilitate exercise adherence.

(vi) Reinforcement and Incentives : These strategies are often associated with self-monitoring or goal setting and involve rewarding yourself or being rewarded by a group leader once you reach an activity-related goal. The best types of rewards are those that are not detrimental towards your overall goal. It could be a physical reward of practical use or simply the acknowledgement amongst peers.

(vii) Problem Solving : This intervention is based around identifying the obstacles and barriers that stand between you and your physical activity goals. It's important to generate and implement solutions, evaluate the outcomes and choose different solutions if needed.

(viii) Social Support : Taking part in physical activity as part of a group programme, with a friend or family member or interactions with health professional can increase exercise adherence as you will have to interact with a network of people working towards a common goal.

(ix) Involving Recreational or Tailoring Physical Activity : Evaluate which type of activity is physically possible and the barriers that can prevent a successful increase in activity. Accordingly, experts or coaches should assist in developing a physical activity plan, based on the initial assessment. Physical activity should be started at a low level and gradually increased to a goal.

(x) Adding Variety to Exercise : Lack of new variety of exercise may lead to boredom and dropping out. Boredom can be tackled with the addition of a variety of exercises and moves that address the same body issues, without loss of therapeutic benefits. Adding variety to the exercise programme through adoption of new strategies, changing methods, using new equipments, re-inventing logistics and adding new members can induce fresh energy to the exercising activity, thus enhance adherence to exercise.

(xi) Building the Mindset for Active Lifestyle : An initial assessment is needed to determine the current activity levels. Expert should ask them how they judge their actual level of physical activity, and if they believe that it is adequate to lose or maintaining body weight.

(xii) **Rewarding :** Strategy must be made to reward the persons doing physical activity.

(xiii) **Simple to Complex :** The activities must be started from simple to complex after adaptation of previous. It should be increased gradually.

4.(A) CONCEPT OF AGGRESSIONS IN SPORTS

The term aggression refers to a range of behaviour that can result in both physical and psychological harms to own, others or objects in the environment. This type of social interaction centres on harming another person, either physically or mentally. Aggression is overt, often harmful, social interaction with the intention of inflicting damage or other unpleasantness upon another individual.

According to Baron and Richardson, Aggression is "any form of behaviour directed towards the goal of harming or injuring another living being who is motivated to avoid such treatment".

According to Thesaurus, Aggression is a "forceful action or procedure (such as an unprovoked attack) especially when intended to dominate or master".

According to Merriam Webster Dictionary, Aggression is "hostile, injurious, or destructive behaviour or outlook especially when caused by frustration".

CAUSES OF AGGRESSION :

The causes of aggression differs according to the age patterns such as :

(*i*) **In Children :** Poor relationship skills, underlying health conditions, stress or frustration.

(*ii*) **In Teens :** Yell during arguments, gets into fight, bully others, stress, peer pressure, substance abuse, unhealthy relationship with family members or others.

(*iii*) **In Adults :** Job stress, unhealthy relationship with family or friends, ego, to prove dominance, socio-economic problems, poor physical health, mentally ill or sick, unhealthy conditions at home or institution, stroke, head injury, infection, disease, weakness or illness etc.

Forms of Aggression : Physical, verbal, mental, emotional.

Purpose of Aggression : There are various purposes of aggression such as : To express anger or hostility, to assert dominance, to achieve goal, to threaten or intimidiate, to express the precession, a reaction against pain, a response to fear or failure, to compete with others.

4.(B) TYPES OF AGGRESSION

It has various types such as :

(I) HOSTILE / IMPULSIVE / REACTIVE / AFFECTIVE AGGRESSION : Hostile aggression is a type of aggression that is committed in response to a perceived threat or insult. It is unplanned, reactionary, impulsive, and fueled by intense emotion as opposed to desire to achieve a goal. Aggressors typically have a sense of a loss of control during outbursts, and characteristically experience physiological hyper arousal. It is characterized by strong emotions of anger. It is often instant and not planned. It often takes place in the heat of the movement. The main aim of this type of aggression is to cause physical harm like deliberate bouncer in cricket to shake the opponent, in football match a player punching opponent instead tackling opponent all of a sudden movement.

(II) INSTRUMENTAL / PREDATORY / CHANNELED AGGRESSION : Instrumental aggression is a harmful behaviour engaged in without any provocation to obtain an outcome. It is marked by intended behaviour to achieve a large goal. This is often done with careful planning and usually exists as mean to an end, like aggressor's goal is to win the competition, without actual anger. For example, elbowing and injuring a player to gain a competitive advantage, or late tackling to stop an opponent from scoring a goal. Another example of instrumental aggression is that of a basketball player playing a foul against an opponent with the purpose of scoring.

(III) ASSERTIVE BEHAVIOUR AGGRESSION : It is the behaviour that involves the use of legitimate physical or verbal force to achieve ones purpose such as sledging in cricket to cause psychological discomfort to the batsman, instigating opponent to commit mistake or serious foul.

Aggression–Types and Characteristics

	Hostile	Instrumental	Assertive
Intent	Harm or suffering	Harm or suffering	No harm
Primary Goal	Harm or injury	Win or advantage	Win or advantage
Process	Non-Legitimate	Non-Legitimate	Legitimate
Emotion	Anger	No Anger	Unusual effort and energy expenditure
Explanation	Self-justification instead of apology	Offer apologies	Offer apologies
Examples	Deliberate bouncer in cricket to shake the opponent, in football match a player punching opponent instead tackling opponent all of a sudden movement	Elbowing and injuring a player to gain a competitive advantage, or late tackling to stop an opponent from scoring a goal	Sledging in cricket to cause psychological discomfort to the batsman, instigating opponent to commit mistake or serious foul

4.(C) AGGRESSION IN SPORTS

In sports, aggression is a characteristic that can have many negative as well as positive effects on performance. However, some sports psychologist agrees that aggression can improve performance. This is called an assertive behaviour, where a player plays within the rules of game or sport at a very high intensity, and has no intention to harm his opponent.

FACTORS INFLUENCING AGGRESSION IN SPORTS

***(i)* Emotional Identification** : Aggression in sports is highly influenced by emotional identification with the team and develops high team spirit.

***(ii)* Tactical Ability** : Aggression in sports depends upon the tactical ability of the team.

***(iii)* Goal Orientation** : Aggression is influenced by goal orientation and their feedback like desperate to win.

***(iv)* Temperature** : High temperature leads to high aggression of an individual.

***(v)* Perception of Victims Intent** : If an athlete perceives that his/her opponent's intent is to cause harm or injury, will be more inclined to act with aggression towards his opponents.

***(vi)* Fear of Retaliation** : It can inhibit aggression shown towards an opponent out of both fear and respect. Players are often less likely indulge in unsportmanship play if they are likely to get exactly the same back in return.

***(vii)* Game Structure** : More aggression occurs when there is a big difference of score whereas close contested game have less aggression in players.

***(viii)* Traditional Rivalry** : In some games, there is traditional rivalry thus aggression is high in them.

***(ix)* Home Ground** : Players playing on home ground or playfield have less aggression whereas opponent or away team faces lot of spectator's pressure thus their aggression is high.

***(x)* Skill Ability** : Players with good skill ability are less aggressive whereas players with less skill ability are more aggressive.

EFFECTS OF SPORTS AGGRESSION

***(i)* Affects Performance** : Aggression in sports often declines the performance, moreover, skill perfection is less due to aggression.

***(ii)* Injury** : Physical Aggression often be the cause of injury.

(iii) **Affects Mental Stability :** Often extreme aggression affects the mental stability of the person thus frustration arises.

(iv) **Lack of concentration :** Often extreme aggression causes lack of concentration.

(v) **Effects on Health :** Extreme aggression causes adverse effects on the health of an individual.

(vii) **Bad Image :** Aggression creates a bad image over others.

(viii) **Lead to Crime :** Aggression often causes violence which is a crime and an anti-social act.

AGGRESSION MANAGEMENT TECHNIQUES

(i) **Deep Breathing :** Aggression can be controlled through deep breathing. Even yogic pranayams like Anulom-Vilom, Kapal-Bhati are also effective.

(ii) **Drink Water :** Drink water when symptoms of aggression develops. Avoid overdrinking of water.

(iii) **Follow Expert Advice :** Follow the advice of experts and take their suggestions and guidance. Avoid multiple suggestions from those who are not experts.

(iv) **Psychological Balance :** The psychological balance should be maintained before the activity. Do not feel stressful and prepare yourself psychologically for the activity. Do not show panic reaction.

(v) **No Criticism :** One should not criticise anyone before performing stressful activity. Criticism leads to aggression.

(vi) **Focus on Your Target :** The players should focus or concentrate on their target. Do not get distracted towards unrelated or non-required things.

(vii) **Do Sufficient Practice :** One should do sufficient practice of the activity so that individual should be comfortable with the activity.

(viii) **Be Self-Confident :** Individual should be self-confident to perform the activity whereas overconfidence or lack of confidence should be dangerous.

(ix) **Encouragement :** The person should be motivated and encouraged by close ones, this stabilizes his anxiety level.

(x) **Participate in Physical Activity :** If a person is in stress and anxiety then he should participate in a physical activity. This will balance his psychological state.

(xi) **Staying Cool and Confident :** A person having high stress and anxiety should stay cool and confident.

(xii) **Avoid the Company of Stressed Person :** The stressor should avoid the company of stressed person and stay alone.

5. PSYCHOLOGICAL ATTRIBUTES IN SPORTS

Meaning of Psychological Attribute: Attribute means a quality or characteristic that someone has; in other words, it is related with a quality or feature of a person especially related to social nature. Psychological attributes are related to the mental equilibrium of the individual that embedded or encourages the individual in his/her social interactions.

Psychological Attribute through Sports: Participation in games and sports improves the behaviour and psychological factors to a great extent. Thus, it boosts the psychological attributes of the individual like boosting or improving the Self-Esteem, Mental Imagery, Self-Talk, Goal Setting, Happy feeling etc.

PSYCHOLOGICAL FACTORS ATTRIBUTING IN SPORTS

(i) **Self-Esteem :** In psychology, the term "Self-Esteem" is used to describe a person's overall sense of self-worth or personal value. Self-esteem is an essential human need that is vital for survival and normalcy.

Self-esteem can involve a variety of beliefs about the self, such as the appraisal of one's own appearance, belief, emotions and behaviours. Self-esteem arises automatically from within. It is based upon the person's belief and consciousness. Self-esteem occurs in conjugation with thoughts, behaviour, feeling and actions. Positive Self-Esteem focus on the positive aspects of life and develops talents and accomplishments, confidence, satisfaction, improves body image, overall personality, socialization etc. Participation in games and sports improves the self-esteem of the individual.

(*ii*) Mental imagery : It is the state of mental imagination where an athlete imagin himself in an environment performing a specific activity by using his senses (sight, hear, feel and smell). It gives him the feeling of satisfaction and confidence of doing the difficult things. It develops positive attitude like resourceful, success, self motivation, overcoming hurdles. It stabilizes the anxiety, improves body image and removes negative thoughts, depression, overstress, obsession etc. Through participation in games and sports we improve the Mental Imagery to great extent.

(*iii*) Self-Talk : Self-talk is one of the strong internal motivating factors by which we can easily overcome the challenges or hurdles. It boosts us internally moreover helps to self-correct own mistakes. Self-talk helps in regaining the lost focus, moreover it re-energies person to do better and do constant effort. In sports activities self-talk is commonly practiced thus improves the performance of individual.

(*iv*) Goal- Setting : It is the strategic aspect followed to achieve the success or victory. This is commonly practiced in games and sports, thus helpful in setting the goals and achieving the step by step. It is also a strong internal motivating factor and brings success or victory. Thus, participation in games and sports helps in Goal-setting and Focus on target.

(*v*) Happy Feeling : Participation in games and sports helps to bring happy and cheerful mood, thus person gains encouragement to do more along-with enjoyment. Games and sports recreate, refreshes and re- energies us with full of enthusiasm.

(*vi*) Psychological Well-being : Participation in games and sports and exercise brings positive changes in the psychological well-being of an individual. Thus, improves our behaviour to and adjust well in social group.

(*vii*) Cognitive Development : Participation in games and sports develops the cognitive abilities of the individual to great extent thus personality improves.

(*viii*) Overcoming Stress : Physical activities helps to overcome stress and depression. It removes the negative thoughts and negative attitude. Games and sports are helpful in developing the wellness of the individual.

(*ix*) Develops Interest : Participation in games and sports helps in developing the positive attitude and interest of the individual.

(*x*) Coping Under Pressure : Excessive stress is not good for our health in general. Participation in games and sports helps in coping under pressure.

Some Important Questions

Multiple Choice Questions (MCQs)

1. Personality of the individual can be judged through :
   (*a*) Physical dimensions
   (*b*) Cognitive dimensions
   (*c*) Social dimensions
   (*d*) All of these
2. Introvert personality is characterised like :
   (*a*) Friendly, talkative and good social activities
   (*b*) Shy, talk less and self-centred
   (*c*) Leadership ability
   (*d*) Less strength and slim

UNIT 10

TRAINING IN SPORTS

TOPICS & LEARNING OUTCOMES

1. **Concept of Talent Identification and Talent Development in Sports : It will help to understand how to identify and develop talent in sports.**
2. **Introduction to Sports Training Cycle – Micro, Meso, Macro Cycle. In this we will understand Sports Training and the different cycle in sports training.**
3. **Types and Methods to Develop – Strength, Endurance and Speed : This topic will help to understand the training method to improve the components of fitness.**
4. **Types and Method to Develop – Flexibility and Coordinative Ability: This topic will help to understand different types and methods of flexibility and coordinative ability.**
5. **Circuit Training – Introduction and its importance : To make the students understand Circuit training and its importance.**

1.(A) CONCEPT OF TALENT IDENTIFICATION AND TALENT DEVELOPMENT IN SPORTS

The goal of a talent identification decision is to correctly identify a developing athlete with the potential to become a successful elite performer in their respective sport. The identification of talent in sport is often erratic and subjective.

According to Vaeyens, Lenoir, Williams, & Philippaerts : Talent identification is the process of recognising current players that have the potential to excel; while talent selection is the acceptance of individuals into representative teams and development programmes.

According to Abbott & Collins : Talent identification involves an attempt to predict the future capacity of performance of an individual.

Talent identification shouldn't be done too early (3 to 6 years) whereas the young kids (7 to 9 years) should get good and full chance to develop the physical skills and enjoying sports. Talent identification at a young age makes no sense in most sports. After giving the basic training and development of inters then children should be identified and given advanced training. There are many clubs and federations which should invest in all kids equally and at an age of 11-13 there is still sufficient time to identify and develop talent, with the exception of some early-performing sports like gymnastics.

The selector/ teacher/ coach should be clear about future potential of that child and understand their potential based upon physical, psychological and health factors of that child.

The key components to identify talent in sports among children are as follows :

(i) Physical characteristics : It consists of Height, Weight, Size, Body structure, Shape of child etc. Each games/sports require specific type of physical characteristics, thus it is considered for talent identification.

(ii) Physiological characteristics : In this, we consider such as Strength, Speed, Endurance, Flexibility and Coordinative ability or Agility and Fitness etc. These physiological factors vary from game to game like some games require more endurance; in some activities speed is more, in some sports strength is higher etc. These physiological characteristic are helpful in almost all games and sports.

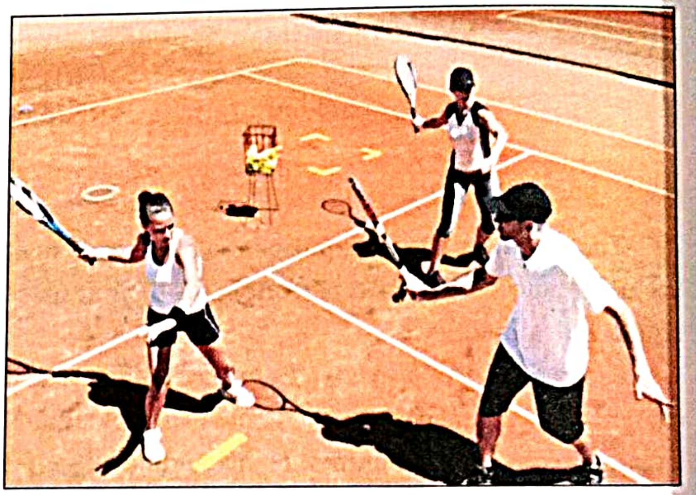
(iii) Health and Heredity characteristics : It consists of good health such as Immunity level, Muscle fiber (Slow twitch, Fast twitch muscle fiber), Heredity problem etc.

(iv) Performing the Basic Skill characteristics : It consists of learning of basic skills-Dribbling, Passing, Control and Shooting, along with defensive skills, ability to perform, perfection in these basic skills and its adaptation etc.

(v) Psychological and Cognitive characteristics : These psychological factors are such as learning and adaptation to new skills, behaviour, desire to learn, attitude, effort, motivation, maturation level, perception etc.

(vi) Performance in Competition: Healthy sports competition among same age group is easy and best way to identify talented children etc.

(vii) Conducting Motor Fitness tests or related tests : Motor fitness test, game perfection test or related tests also helps to identify talented children etc.



Most of the psychologist and sports expert believes that 11+ age group is most suitable to identify and develop talent in children for sports (except in few games and sports like gymnastics etc). In this stage of childhood, gross and fine motor development activities are developed along with fitness. In this age, the main concern is to develop fine motor components especially endurance, flexibility and coordinative ability. Physical activity recommended should be 3 to 4 hours in one or two sessions; where the intensity should be from moderate to vigorous activities in children. Activities like Yoga asanas, Gymnastics, Athletic, Swimming etc are good sports activities for this age group. Recreational ball games and games like Football, Basketball, Handball, Volleyball, etc. are helpful. Racket games like Badminton, Table Tennis, and Tennis also help to develop fine motor development skills. As this is fast growing stage thus good and healthy diet (more amount proteins) should be provided. Group cohesion friendship bonds and habits formation comes in this stage thus, good friend, healthy hygienic habits should be motivated. At least 9 to 11 hours sleep is recommended by the experts.

2.(A) CONCEPT OF SPORTS TRAINING

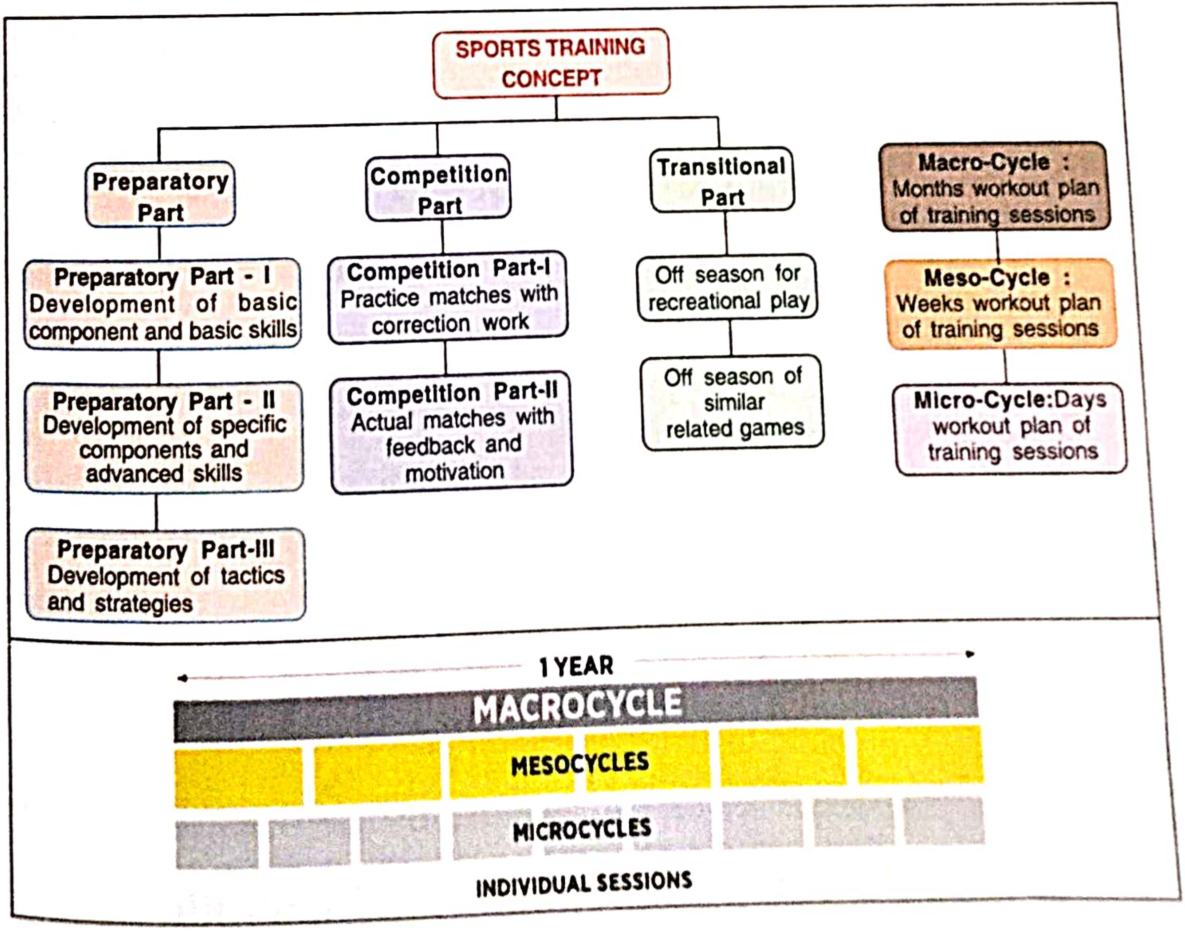
According to Mathew, **"Sports training is the basic form of preparation of a sportsman".**

According to Martin, **"It is a planned and controlled process of achieving goals in which the changes of motor performance and behaviour are made through measures of content, methods and organisation".**

The word "training" means to give practical and theoretical knowledge.

In physical education, this word has a very deep meaning. **Training is of various types or means to enhance sports performance. In other words, it is a long term processes based on scientific and systematic ways to enhance sports performance.** Training methods are based upon the scientific principles in a systematic order. Training is based on various aspects in its process like specific individual care, improve specific fitness, scientific ways, psychological feedback, technical help, good machines and apparatus, considering climate, diet, safety means, etc. It helps to develop basic skills, advanced skills, techniques, tactics, strategies, emotional stability during competition, motivational forces, etc. In simple words, we can say that these are the methods to improve general and specific performance in games and sports. **Training gives us knowledge (practical and theoretical) regarding performance and also guides us how to improve further through different ways.** Its knowledge is good for coaches as well as important for a players.

Training method consists of training periods which split into training sessions and training sessions are further divided into training schedules. In training periods, the workout or load is performed in sessions which are made-up of various schedules. Training methods are further programmed for quarterly, half yearly, annually or bi-annually result-based processes. **These are performed in a**


SPORTS TRAINING CONCEPT
Preparatory Part
Competition Part
Transitional Part
Macro-Cycle : Months workout plan of training sessions
Preparatory Part - I Development of basic component and basic skills
Competition Part-I Practice matches with correction work
Off season for recreational play
Meso-Cycle : Weeks workout plan of training sessions
Preparatory Part - II Development of specific components and advanced skills
Competition Part-II Actual matches with feedback and motivation
Off season of similar related games
Micro-Cycle:Days workout plan of training sessions
Preparatory Part-III Development of tactics and strategies
1 YEAR
MACROCYCLE
MESOCYCLES
MICROCYCLES
INDIVIDUAL SESSIONS

progressive way through macro-cycle (also known as month plan). In this, the big objectives are achieved. The weeks plan of doing work is known as Meso cycle. In this, the small objectives are achieved through 1 to 2 weeks work out plans. The very short go objectives or smaller goals are achieved in day to day plan. It is termed as Micro cycle. Training involves sufficient repetition of work. In training, the basic skills are repeatedly practised until their mastery is achieved. The advanced skills are practised only after achieving the mastery of basic skills. Training programme has to be planned previously and should follow the systematic progression without bringing decline in performance. It has to be followed with proper loading and adoption. It requires sufficient rest and recovery.

TRAINING PERIODS

It should consider motivational factors for best results. It has three parts :

(a) Preparatory period (b) Competition period (c) Transitional period (Off Season)

(A) PREPARATORY PERIOD : In this period, player achieves the physical fitness and skill efficiency for the competition. It is practised in three phases :

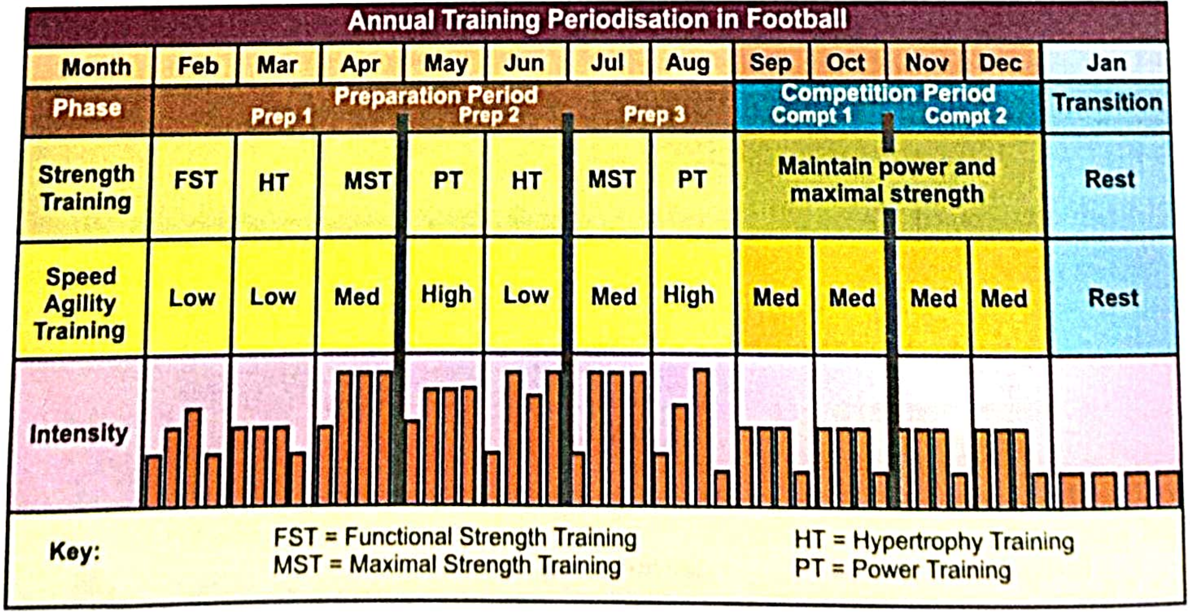
Phase 1 : In this phase of training, the player develops the general abilities relating to physical fitness like strength and endurance along with basic skills. The player can be perfect in this about 4-6 months practice in an annually planned training methods.

Phase 2 : In this phase of training, the player develops the specific physical fitness abilities like speed and flexibility. Player learns the mastery over advanced skills and techniques. It is done for about 2 months practice.

Phase 3 : In this phase of training, the player develops the tactics, strategies, coordination and tries to achieve every perfection for the competition.

(B) COMPETITION PERIOD : In this period, player participates for competition and aims to achieve top performance in competition. Initially some practice competition or practice matches are played where mistakes are corrected (known as Competition Part I). Later actual matches are participated where motivation and feedback are provided for peak performance of player (known as Competition Part II).

(C) TRANSITIONAL PERIOD (OFF SEASON) : This is a relaxing period after competition to recover from stress of training. In this period, player gets recovery from competition stress and maintains physical abilities for the next competition. Initially recreational activities are performed afterward similar types of activities are played along with recreation.



Annual Training Periodisation in Football

Month	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Phase	Preparation Period							Competition Period				Transition
	Prep 1			Prep 2		Prep 3		Compt 1		Compt 2		
Strength Training	FST	HT	MST	PT	HT	MST	PT	Maintain power and maximal strength				Rest
Speed Agility Training	Low	Low	Med	High	Low	Med	High	Med	Med	Med	Med	Rest
Intensity												

Key:
FST = Functional Strength Training
MST = Maximal Strength Training
HT = Hypertrophy Training
PT = Power Training

TRAINING CYCLES

Macro-Cycle of Training : A macro-cycle is an annual plan that works towards peaking for the goal competition of the year. There are three phases in the macro-cycle: preparation, competitive, and transition. The entire preparation phase should be around 2/3 to 3/4 of the macro-cycle. The preparation phase is further broken up into general and specific preparation of which general preparation takes over half. An example of general preparation would be building an aerobic base for an endurance athlete. An example of specific preparation would be to work on the proper form to be more efficient and to work more on the final format of the sport.

Meso-Cycle of Training : A meso-cycle represents a phase of training with a duration of between 2 – 6 weeks or micro-cycles, but this can depend on the sporting discipline. A meso-cycle can also be defined as a number of continuous weeks where the training program emphasize the same type of physical adaptations, for example muscle mass and anaerobic capacity. During the preparatory phase, a meso-cycle commonly consists of 4 – 6 micro-cycles, while during the competitive phase it will usually consist of 2 – 4 micro-cycles depending on the competition's calendar. The goal of the plan is to fit the meso-cycles into the overall plan timeline-wise to make each meso-cycle end on one of the phases and then to determine the workload and type of work of each cycle based on where in the overall plan the given meso-cycle falls.

Micro-Cycle of Training : A micro-cycle is typically a week because of the difficulty in developing a training plan that does not align itself with the weekly calendar. Each micro-cycle is planned based on where it is in the overall macro-cycle. A micro-cycle is also defined as a number of training sessions, built around a given combination of acute program variables, which include progression as well as alternating effort (heavy vs. light days). The length of the micro-cycle should correspond to the number of workouts - normally these are 4-16 workouts. It takes for the athlete or fitness to adapt to the training program. When the athlete or fitness has adapted to the program and no longer makes progress, a change to one or more program variables should be made.

2.(B) PRINCIPLES OF SPORTS TRAINING

Principles are the scientific and systematic way to improve sports performance. They guide us to develop our physical fitness abilities to improve further.

The training programme has to follow the principles of training. The important principles are :

***(i)* Principle of Continuity or Regularity** : Regularity is very important to improve further. The programme of training should be followed regularly without long break. Irregular schedule does not improve fitness. It is a biological necessity.

***(ii)* Principle of Proper Over Loading** : A gradual increase in physical activity brings improvement. The work or load should be increased gradually after the adaptation of previous work or load.

***(iii)* Principle of Specific and Scientific Training** : The activity should be performed in scientific ways according to the requirement of the game. It should particularly improve the desired ability.

***(iv)* Principle of Individual Difference** : The training programme should be according to the limits of an individual; keeping in mind the age, sex, height, heredity and environmental factors.

***(v)* Principle of Rest and Recovery** : There should be proper rest, relaxation and sleep after every schedule of hard work. The recovery should not be very long so that the one should be ready for further workout.

***(vi)* Proper Warming-up and Limbering down** : The training work should be started with warming-up and ended with limbering down. It is also important for prevention of injuries.

***(vii)* Principle of Progression** : The training programme should follow a proper progression. It should start with an easy activity in the beginning and harder activities later on, i.e., simple to complex.

***(viii)* Safety and Prevention** : Prevention is always better than cure. So we should keep in mind the safety measures while performing physical training schedule.

(*ix*) Psychological Feedback : The psychological feedback (motivation) keeps the enthusiasm and pleasure in activity. It energizes to perform further. Thus, training should be consider as motivational factor.

(*x*) Medical Check-up : Proper medical check-up should be done before any hard physical training. Doctor's consultation should be taken in cases of injury, illness and rhythmic weakness.

(*xi*) Total Body Involvement : The training programme should be designed in such a way that one should exercise every part of the body to ensure proportionate body development, i.e., total body involvement.

(*xii*) Adaptation and Tolerance : Exercises performed by an individual should be adapted to one's tolerance ability. Exercise tolerance is the level/capacity at which the human body favourably responds to training.

(*xiii*) Principle of Load and Adaptation : This principle states that the workout or load should be gradually increased in a progressive way according to adaptation. This increase in workout or load has to be given in two ways : (*a*) Step method (*b*) Linear method

(*xiv*) Principle of Reversibility and Repetition : According to this, the workout or load must be done with sufficient repetition. The activity should be repeated again and again so that proper adaptation and acclimatisation should be taken up by the individual. The next schedule should be practised before starting new schedule or workout or load.

3.(A) STRENGTH (DEFINITION, ITS TYPES AND METHODS TO DEVELOP)

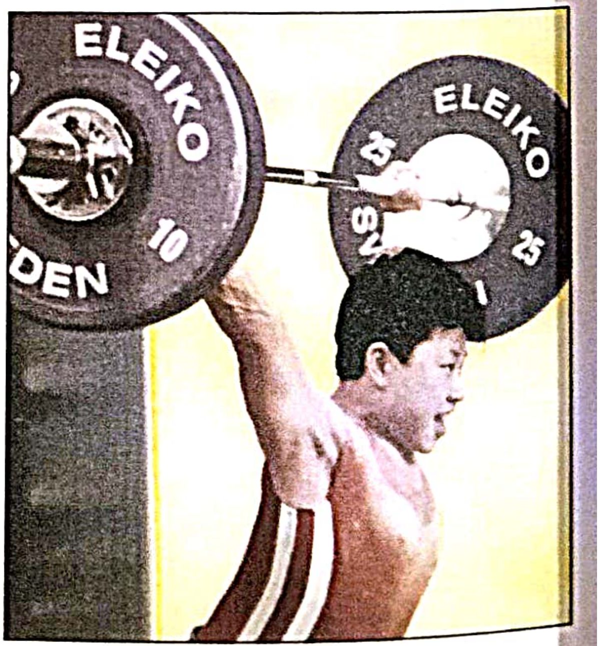
Strength is an ability of muscles to overcome resistance or act against resistance. Strength can be defined as the amount of force a muscle can exert. It is an essential component for games and sports. Different games require different levels and types of strength. It can be improved through systematic training. **To develop each sub-component of strength, we need to consider the following measures :**

(*i*) Intensity or Speed of Workout
(*ii*) Load or Resistance or Weight
(*iii*) Volume or Duration of Workout
(*iv*) Frequency or Repetition
(*v*) Rest or Recovery

TYPES OF STRENGTH

(A) STATIC STRENGTH : It is also known as Isometric strength. It is the ability to act against resistance from single or one position, e.g., arm wrestling, power lifting, pushing wall, etc.

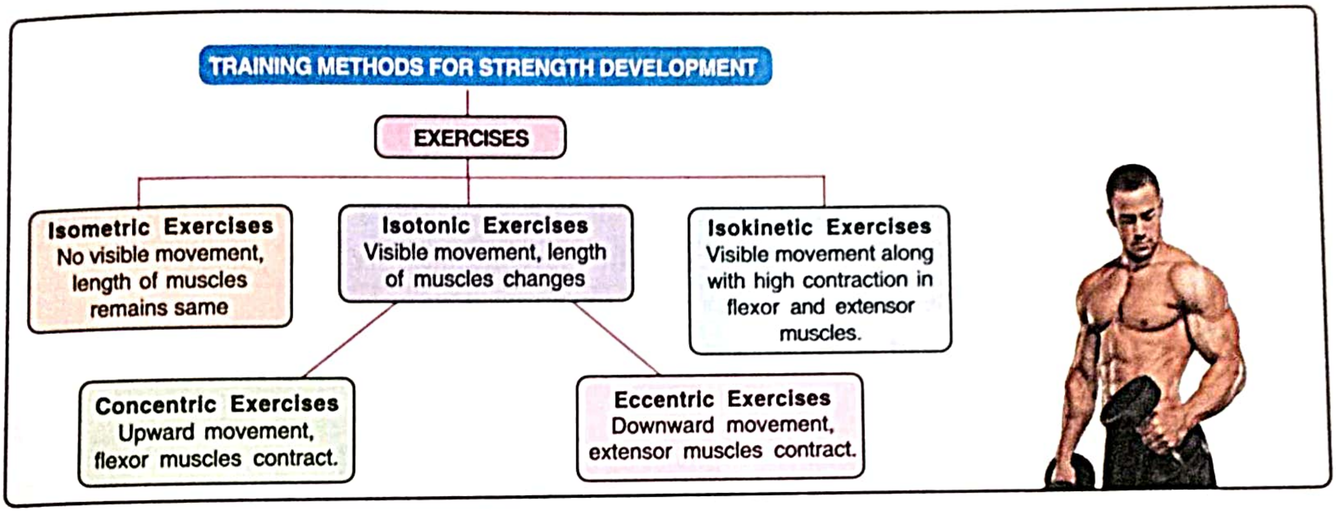
(B) DYNAMIC STRENGTH : It is also known as Isotonic strength. It is related to the movement. Thus, we can say that it is required for the movement. It is of three types :



(*i*) Maximal Strength : It is the ability to act against maximum resistance. It is also known as Power. It is the quality of muscle to contract forcefully in the quickest possible time. It is more required in weightlifting, throwing, wrestling, etc. It can be measured by throw attempts and power lifting.

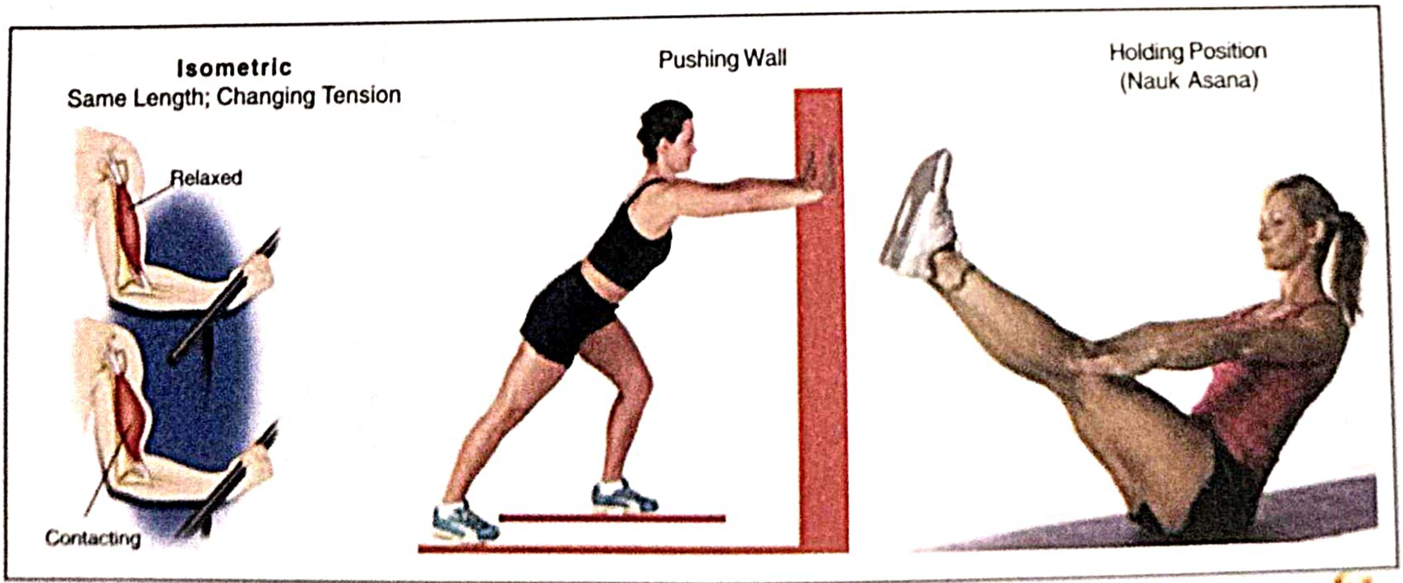
(*ii*) Explosive Strength : It is the ability to overcome resistance with a high speed. In fact, it is the combination of strength and speed. In simple words, it is the ability of muscles to perform forceful movement at quickest possible time. It is also termed as explosive power, generally required in jumping activity and also in those games and sports where very fast and powerful responses are required. This strength can be measured by dynamometer or by jumps chinning test.

***(iii)* Strength Endurance : It is the combination of strength and endurance ability. It is defined as the ability to overcome resistance under fatigue condition. It is also named as 'Stamina'.** This quality enables a person to sustain localized muscle group for extended period of time. It is commonly required for long distance races, swimming, road cycling and mountaineering, etc. Strength endurance can be measured through chin-ups.


TRAINING METHODS FOR STRENGTH DEVELOPMENT
EXERCISES
Isometric Exercises
No visible movement, length of muscles remains same
Isotonic Exercises
Visible movement, length of muscles changes
Isokinetic Exercises
Visible movement along with high contraction in flexor and extensor muscles.
Concentric Exercises
Upward movement, flexor muscles contract.
Eccentric Exercises
Downward movement, extensor muscles contract.

I. ISOMETRIC EXERCISES

The isometric exercises were firstly explained by Hettinger and Muller (1953). They were having the views that tremendous amount of strength can be developed through these exercises. **Isometric is derived from Latin word which means same length. In these strength-training exercises, the length of muscles remains the same during workout. These exercises, have no external movements and work done is zero.** Hence, these exercises have no visible movement, though lot of pressure is experienced by the person performing it. In isometric exercises muscles, contract but do not move the joint, thus muscle fibers maintain a constant length. In these exercises, muscles develop slot of tension, i.e. muscles become hard but there is no movement taking place and the length of muscles does not change during these exercises. In these exercises, the flexor and extensor muscles feel tremendous resistance over muscles whereas there is no movement of muscles. These exercises are effective for weightlifting, gymnastics, judo,


Isometric
Same Length; Changing Tension

Pushing Wall

Holding Position
(Nauk Asana)
Relaxed
Contacting

wrestling, kabaddi, etc. Examples of these exercises are pressing or pushing the wall, lifting very heavy weight, holding the static position, pulling rope in tug of war, arm-wrestling, etc.

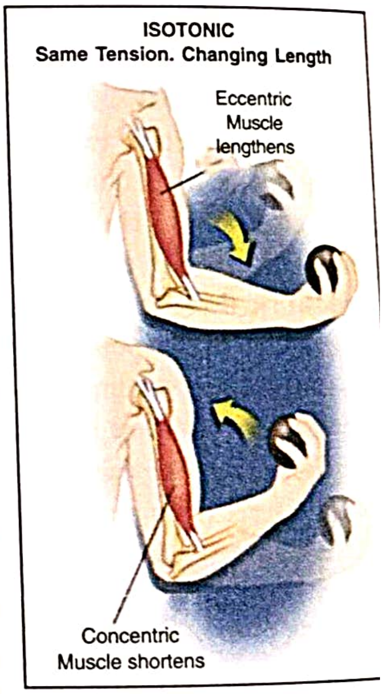
Advantages of Isometric Exercises :

(*i*) It can be performed anywhere; moreover, no helper is required.
(*ii*) In isometric exercises, less or no equipments are required as immovable objects are used.
(*iii*) Less time is required to perform whereas effects are more.
(*iv*) It can be performed by an injured player (according to player's level, under care and precautions).
(*v*) Isometric strength training exercises develop high level of static strength and maximal strength, thus effective for total muscular strength.
(*vi*) These exercises can be performed during warming-up sessions.

Disadvantages of Isometric Exercises :

(*i*) It develops static strength whereas in most of the games and sports dynamic strength is required.
(*ii*) Isometric exercises raise the blood pressure (not recommended for heart patients).
(*iii*) Loss of interest after a few days because of same type of exercises.
(*iv*) There is less variety of isometric exercises.

II. ISOTONIC EXERCISES


ISOTONIC
Same Tension. Changing Length
Eccentric Muscle lengthens
Concentric Muscle shortens

Isotonic exercises were developed by De Lorme (1954). Isotonic is derived from Latin word which means same tension. In these strength training exercises, the muscular group has tension along with movement. **In isotonic exercise the length, of muscles changes (shortens or lengthens). It shortens during action along with tension in them.** Some work is done during these exercises, like jumping, running, doing skills, lifting weight, doing any action with movement, etc.

Isotonic exercises are of two types : (*i*) Concentric (*ii*) Eccentric.

(*i*) Concentric : It is the upward movement of action in which the flexor (anagonist) muscles shorten during action whereas extensor (antagonist) muscles lengthen in size. In these exercises, one group of muscles (flexor muscles) contracts and opposite group of muscles (extensor muscles) relaxes. Examples of concentric exercises are like biceps curling (flexion of arm), lifting the dumbells, throwing the ball, chin-ups, etc.

(*ii*) Eccentric : It is the type of isotonic exercise in which the extensor muscles shorten in length whereas flexor muscles lengthen during the action, i.e. downward movement of hand. In these exercises, the extensor muscles contract and the flexor muscles relax. Examples of eccentric exercises like lowering the weight (extension arm), dips, push-ups, bench-press, kicking the ball, etc.

Advantages of Isotonic Exercises :

(*i*) It develops dynamic strength. This is mostly required in games and sports.
(*ii*) These exercises develop strength and endurance as both can be developed together.
(*iii*) It brings hypertrophy of muscles, i.e. muscles gain mass along with thickness.
(*iv*) Isotonic exercises improve flexibility, thus muscles have more contractibility.
(*v*) These exercises are used for developing explosive strength along with strength endurance.

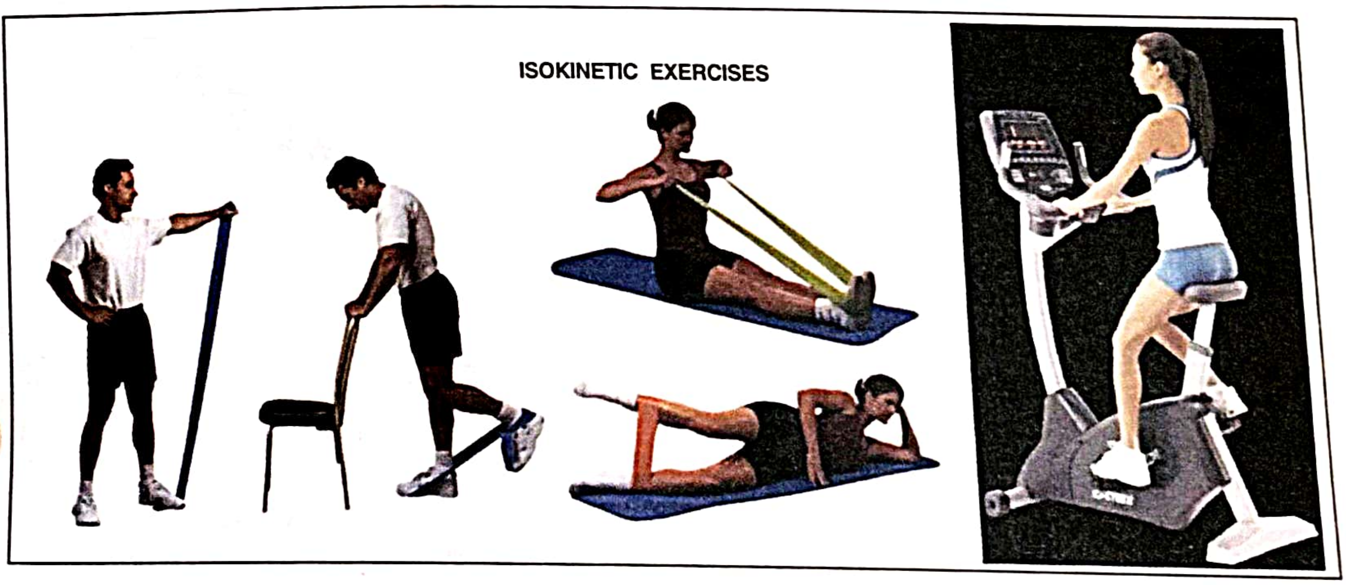
Disadvantages of Isotonic Exercises :

(*i*) Chances of stress and strain injuries (due to jerky actions if body is not properly warmed-up).

(*ii*) Sometimes equipments are required to perform.

(III) ISOKINETIC EXERCISES

Isokinetic exercises for strength training were introduced by J. Perrine (1968). Isokinetic exercises were derived from Latin word which means same motion. In these exercises, there is movement along with continuous tension in both flexor and extensor muscles. In these, the muscles contract maximally throughout the full range of movement at a constant speed, i.e. both flexor and extensor muscles contract simultaneously. Here, both the flexor and extensor muscles have tension along with full range of movement (may be upward or downward). In these isokinetic exercises, flexor and extensor muscles are developed simultaneously. These require special equipment like cycling (upward), swimming, weight training machines (with spring or elastic resistance), etc.


ISOKINETIC EXERCISES

Advantages of Iso-kinetic :

(*i*) Isokinetic exercises develop high level of dynamic as well as static strength.

(*ii*) These are effective for almost every game or sport.

(*iii*) Isokinetic exercises improve endurance along with strength.

(*iv*) It improves all types of strengths like explosive strength, maximal strength, strength endurance.

Disadvantages of Iso-kinetic :

(*i*) It requires special types of equipments.

(*ii*) These exercises should be performed under observation of a coach.

STRENGTH DEVELOPMENT TRAINING EXERCISES

	Isometric Exercises	Isotonic Exercises	Isokinetic Exercises
Introduced by	Hettinger and Muller (1953)	De Lorme (1954)	James Perrine (1968)
Movement	No visible movement.	Visible movement.	Visible movement.
Equipment required	No or less equipments are required.	Equipment may be used.	Specialised equipments are required.

Types	Nil	Concentric Exercises (upward movement) Eccentric Exercises (downward movement)	Nil
Pressure over muscles	Tremendous pressure over muscles.	Average pressure over muscles.	High pressure over muscles.
Changes in muscle length	No change in length of muscles i.e. flexor and extensor muscles length remain same.	Muscle length changes. In concentric exercises, flexor muscles contract (shorten) while extensor muscles lengthen. In eccentric exercises, the flexor muscles lengthen while extensor muscles shorten.	Muscle length changes, i.e. both flexor and extensor muscles contract depending upon resistance and required movement.
Helps for developing	Static strength and maximal strength are developed.	Explosive strength and strength endurance are developed.	All types of strength are developed like explosive strength, maximal strength and strength endurance.
Good for	Power games and sports like Wrestling, Judo, Gymnastics, Kabaddi, Weightlifting.	Almost all games and sports, especially skill games.	Almost all games and sports.
Examples of these	Pushing the wall, holding static position with very heavy weight, etc.	Jumping, running, doing skill, lifting weight, kicking the ball, catching, etc.	Performing cycling, swimming, weight training over machines with spring or elastic resistance.
Not recommended for	Raises blood-pressure, not recommended for heart patient.	May cause injury if movements are fast.	May cause injury.

3.(B) ENDURANCE (DEFINITION ITS TYPES AND METHODS TO DEVELOP)

Endurance is the ability to sustain or continue activity. In other words, it is the ability to resist fatigue. It is one of the important components for middle and long distance races, and is required for almost all major games like football, hockey, basketball, handball, etc. It can be measured through distance run or time factor races.

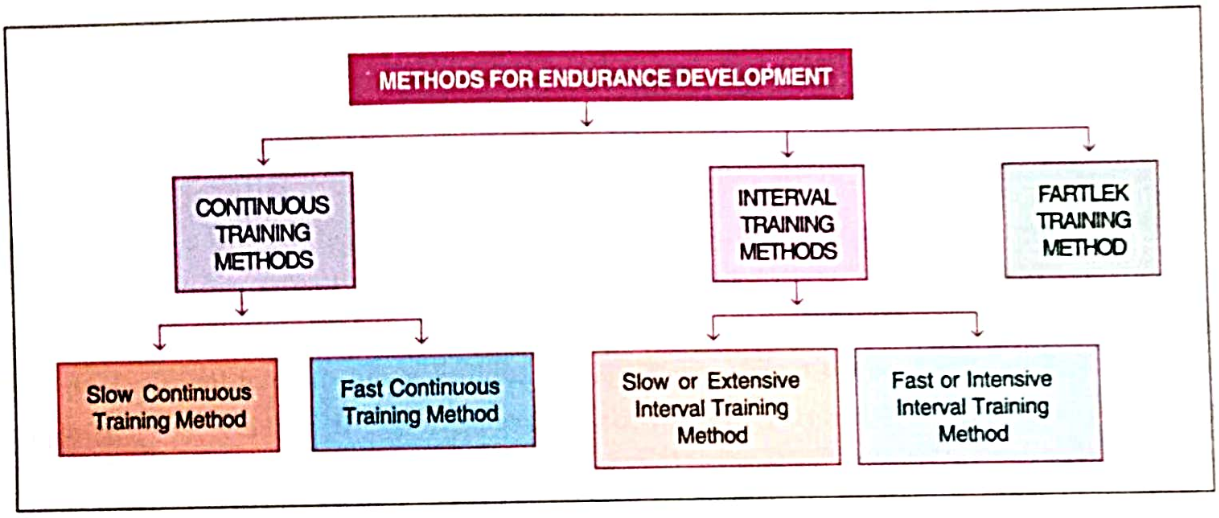
Development of endurance indirectly develops strength and speed. Endurance is required for almost every major game and sport. Nowadays teams and players have equal level of skills and tactical ability where endurance makes a difference in the result of competition. It is of two types :

(A) ANAEROBIC ENDURANCE/ SHORT-TERM/ MUSCULAR ENDURANCE : This endurance is helpful to perform activity with fast speed. It is of two types :

(*i*) Speed Endurance : This is the type of endurance in which the activity is done with high speed or intensity for longer duration. This endurance is for shorter duration (from 30 seconds to 60 seconds) with 80% to 90% of top speed ability. It produces high level of lactic acid, oxygen debt. It causes lot of fatigue. This endurance is mostly required in Medium Distance Races (400 m), Swimming, Games like Basketball, Handball, Volleyball, Tennis, Badminton etc.

(ii) Strength Endurance or Muscular : This is the type of endurance in which the activity is done powerfully and forcefully for a longer duration. In these activities, duration is from 2 to 3 minutes. This endurance requires lot of muscular strength thus also referred as Muscular Endurance. Strength endurance is performed in absence of oxygen with the help of stored energy in muscle as glycogen. This endurance is required in Wrestling, Boxing, Judo, Men Gymnastics, 800 m race etc.

(B) LONG-TERM/AEROBIC/CARDIOVASCULAR ENDURANCE : This type of endurance is helpful when the activity is done for longer duration and the intensity or speed is slower. The duration is more than 5 minutes. It is, in fact, the combination of circulatory with respiratory system which provides continuous energy for workout. In other words, this type of activity is of aerobic nature and speed is slow. It delays fatigue, thus, it is required for Long Distance Races, Road Cycling, Cross-country, Marathon Race, Football, etc.


METHODS FOR ENDURANCE DEVELOPMENT
CONTINUOUS TRAINING METHODS
INTERVAL TRAINING METHODS
FARTLEK TRAINING METHOD
Slow Continuous Training Method
Fast Continuous Training Method
Slow or Extensive Interval Training Method
Fast or Intensive Interval Training Method

(I) CONTINUOUS TRAINING METHODS

Continuous training method is one of the oldest methods in which a player performs running or activity for long period without having any rest, break or interval in-between. In these methods, only the speed or pace makes the difference. It develops very high level of endurance. It is practiced once or twice in a week. It is of following types :

(A) SLOW CONTINUOUS TRAINING METHOD : This method is basically used by cross-Country Runners or Marathon Runners, Distance cycling, Triathlon Athletes, Football players, Hockey players, Basketball players, etc. as it develops high level of aerobic endurance. **In this method, the speed or pace is set slow but the duration of workout or distance is very long. Duration of workout is approximately 30 to 60 minutes whereas the distance covered is 5 to 10 km.** Heart rate is kept around 140 to 170 beats/minute. Work is done with slow pace to medium pace approximately 50 to 70 per cent of the maximum ability. In the end of workout limbering down is performed with maximum stretching exercises.

(B) FAST CONTINUOUS TRAINING METHOD : This method is used basically by Sprinters, Middle Distance Runners, skill games players like Badminton, Tennis, etc. where they require anaerobic endurance along with speed. **The load or workout is performed with faster pace or the workout is faster. It is performed for the duration of 15 to 30 minutes whereas distance covered is 3 to 5 km.** Heart rate is kept around 160 to 200 beats/minute. Workout is done at 70 to 90 per cent of maximum ability as the intensity of workout is very high for longer duration. The cooling-down should be done in the end with more stretching exercises.

CONTINUOUS TRAINING METHOD

Sr. No.		Slow Continuous Training Method	Fast Continuous Training Method
1.	Distance or Workout Duration	10 to 20 km or 1 to 2 hour workout	5 to 10 km or 15 minutes to 30 minutes workout
2.	Heart rate (Pulse)	140 to 170 beats/minute	160 to 200 beats/minute
3.	Speed of Workout (intensity)	50 to 70 per cent of best	70 to 90 per cent of best
4.	Practice session in a week	Once in a week	Once or twice in a week
5.	Good for	Long distance races, major games	Middle distance runner, skill games
6.	Fatigue level	High	Very high

(II) INTERVAL TRAINING METHODS

This training method is also known as Terrace Training. This method was first introduced by Woldemar and Gerschler and again modified by Reindell. This method is considered as the best method for development of endurance. In this method, the principle of "effort and incomplete recovery" is followed. In interval training method, the total workout or total load is done in small parts where incomplete rest is given between each workout or load. It is like :

Workout → Rest → Workout → Rest → Workout → Rest → Workout ...

Interval training method is a special endurance training that involves burst of high intensity workout or load followed by low activity or rest. This method is based upon the scientific principles where effort/load or workout is controlled through various factors to provide incomplete recovery, such as :

(*i*) Volume or Total Distance or Total Load (*ii*) Intensity or Speed of Workout (*iii*) Distance in Intervals or Duration of Workout or Load (*iv*) Number of Repetitions or Frequency (*v*) Duration of Rest between each Interval (*vi*) Heart rate or Pulse factor (*vii*) Mode of Recovery

The main factor used to regulate the Interval Training method is done by increasing or decreasing the rest duration. Here '1:1 Ratio Interval Training Method' represent that the workout or load duration is equal to rest duration. In the '1:2 Ratio Interval Training Method' represent that the workout/load duration is half as compared to rest duration.

In this Interval Training Method, the total workout is divided into small periods. These periods are performed with certain speed in intervals or rest. Incomplete rest or recovery is given in intervals. In other words, the total work is performed in intervals and incomplete rest is given in-between each interval or workout. Interval training method is of two types :

(A) SLOW OR EXTENSIVE INTERVAL TRAINING METHOD : In this method :

(*i*) Total Distance is 5 to 10 km or Volume is 30 minutes to 1 hour workout.

(*ii*) Distance is 300 to 800 metres or 2 to 5 minutes workout at medium pace.

(*iii*) Speed of workout is 60 to 80 per cent (of best speed) or medium pace run.

(*iv*) Frequency or number of repetitions is 15 to 20 times.

(*v*) Duration of rest is 1 to 3 minutes (after each repetition).

(*vi*) Heart rate is kept around 140 to 170 beats/minute.

(*vii*) Mode of recovery is walk or slow jogging or rest.

(B) FAST OR INTENSIVE INTERVAL TRAINING METHOD : In this method :

(*i*) Total distance is 2 to 5 km or volume of workout is 15 to 30 minutes.

(*ii*) Distance is 80 to 300 meters or 30 seconds to 2 minutes workout at fast pace.

(*iii*) Intensity or speed is 80 to 100 per cent (of best speed) or with full ability.

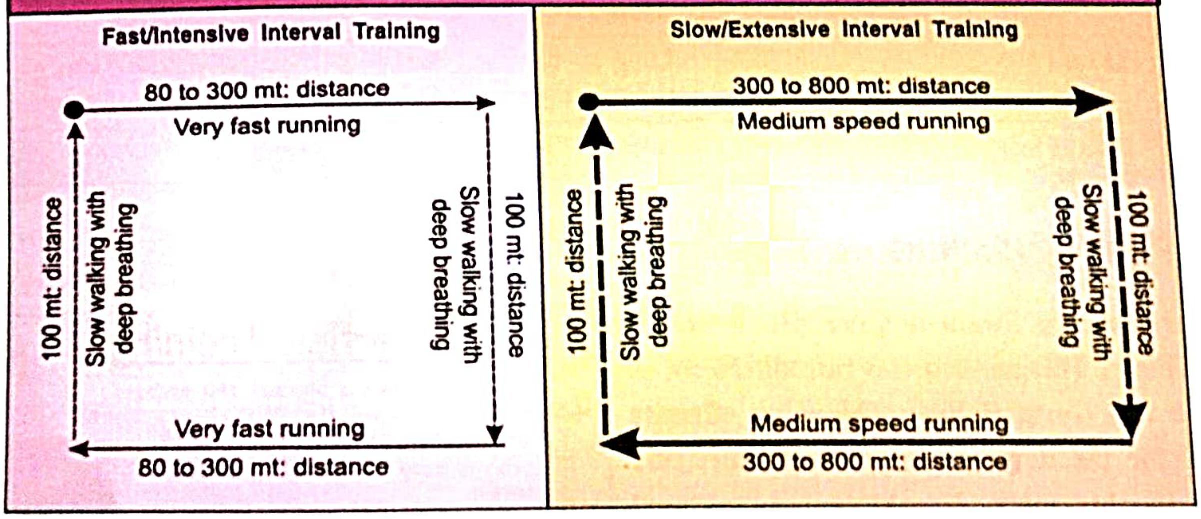
(*iv*) Frequency or number of repetitions is 15 to 20 times.

(*v*) Duration of rest is 1 to 3 minutes (after each repetition).

(*vi*) Heart rate is kept around 170 to 200 beats/minute.

(*vii*) Mode of recovery is walk or slow jogging or rest.

Diagram of Interval Training Method (for Runner)


Fast/Intensive Interval Training
80 to 300 mt: distance
Very fast running
100 mt: distance
Slow walking with deep breathing
Slow walking with deep breathing
100 mt: distance
Very fast running
80 to 300 mt: distance
Slow/Extensive Interval Training
300 to 800 mt: distance
Medium speed running
100 mt: distance
Slow walking with deep breathing
Slow walking with deep breathing
100 mt: distance
Medium speed running
300 to 800 mt: distance

Advantages of Interval Training Method :

(*i*) This endurance training method develops high level of aerobic and anaerobic endurance.

(*ii*) In less number of days we can develop high level of endurance.

(*iii*) Interval training method is easy to administer and organize as coach can easily supervise his trainees.

(*iv*) Rest and recovery is given importance so less chances of over fatigue or staleness.

(*v*) Proper overloading can be provided and applied to players. The progress of athlete can be measured or evaluated easily.

(*vi*) Effective for athletes of almost all games and sports as it develops speed along with endurance.

(*vii*) Very effective for runner, sprinter, middle distance runner, long distance runner. Thus, practiced once or twice in a week.

(*viii*) Proper adaptation of workout is achieved, thus helps in endurance development.

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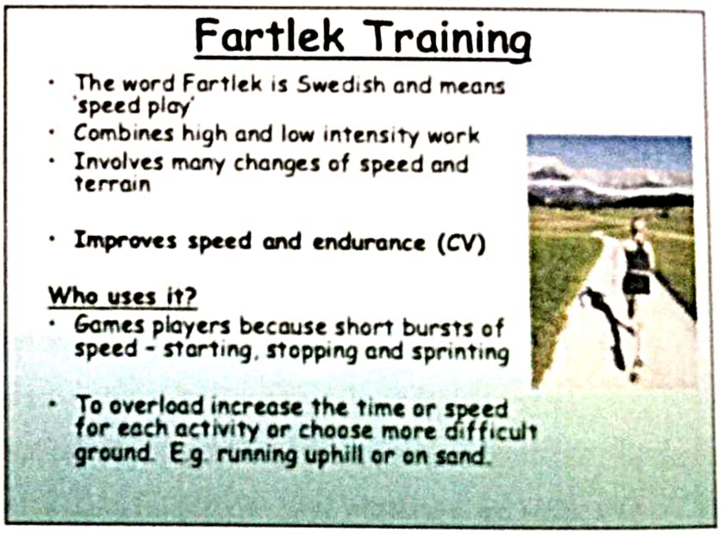
INTERVAL TRAINING METHOD

Sr. No.		Slow or Extensive Interval Training Method	Fast or Intensive Interval Training Method
1.	Total workout volume or total distance	30 min. to 1 hour workout or 5 to 10 km distance.	15 min. to 30 min. workout or 2 to 5 km distance.
2.	Interval period workout or distance in each interval	2 to 5 min. workout or 300 to 800 mt. distance	30 sec. to 2 min. workout or 80 to 300 mt. distance.
3.	Speed of workout or intensity	Slow to medium pace or 60 to 80% of best ability.	Fast to high pace workout or 80 to 100% of best ability.
4.	No. of repetitions or frequency	15 to 20 times	15 to 20 times
5.	Duration of rest or recovery	1 to 3 min. or 1:1 & 1:2	1 to 3 min. or 1:1 & 1:2
6.	Heart rate (pulse)	140 to 170 beats/min.	170 to 200 beats/min.
7.	Mode of rest or recovery	Walking or jogging with deep breathing.	Walking or jogging with deep breathing.
8.	Practice session in a week	Once or twice in a week, performed during Preparatory phase.	Twice or thrice in a week, performed close to competition days.
9.	Good for	Long or medium races and major games	Sprinter, middle distance, fast games or skill games.
10.	Fatigue level	Average	High

(III) FARTLEK TRAINING METHOD



Fartlek Training

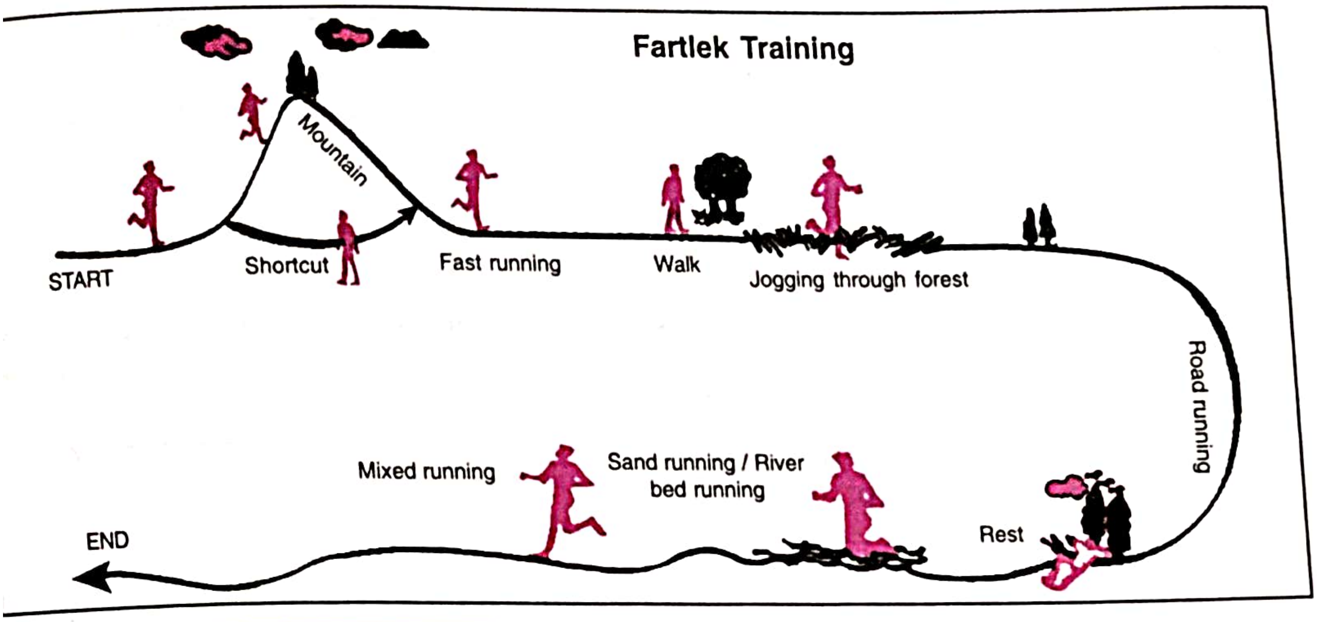
- The word Fartlek is Swedish and means 'speed play'
- Combines high and low intensity work
- Involves many changes of speed and terrain
- Improves speed and endurance (CV)

Who uses it?

- Games players because short bursts of speed – starting, stopping and sprinting
- To overload increase the time or speed for each activity or choose more difficult ground. E.g. running uphill or on sand.

Fartlek is a Swedish term which means 'Speed Play'. This method was introduced by O. Astrand and Gosta Holmer. This is an effective method for the development of endurance and speed. In this method, athlete uses natural resources and environment for workout. Thus the natural track is utilized for running. Athlete is set free to run from a starting point with his own pace, may run fast or slow. Athlete himself regulates or controls his speed. Athlete is made free to choose his path, may it be shortcut or long route. Athlete may take rest by sitting or walking or slow jog. Player may run fast or sprint, etc. but the thing to be kept in mind is that he has to reach the finishing point within the desired time.

In Fartlek Training Method, the natural course is selected as it should have hills, forests, sand, river bed, roads, countryside fields, etc. Before starting, athlete should perform proper warming-up. The approximate distance to be covered is 10 to 20 km. The duration should be kept around 1 to 2 hours. It should be practiced once in a week. It is usually practiced during transitional period or offseason. Athlete should carry water as well as safety tools for emergency.



Advantages of Fartlek training :

(*i*) Fartlek training method is practiced in off-season period.

(*ii*) It develops creativity and gives adventure along with physical fitness.

(*iii*) This endurance training method provides experience of nature.

(*iv*) Natural motivation is there with lot of enjoyment, thus no boredom.

(*v*) Fartlek training method develops the caliber of tackling situation.

(*vi*) Athlete learns to control his speed or pace which is important for long distance running.

(*vii*) Art of self-learning is experienced as there is lot of variation.

Disadvantages of Fartlek training :

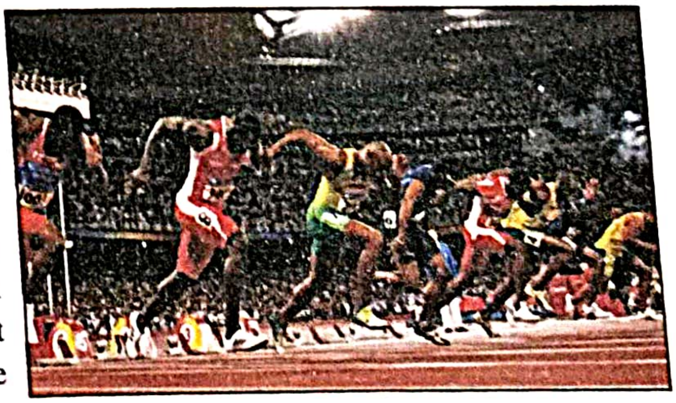
(*i*) Fartlek training method may cause accident as path is not pre-planned.

(*ii*) Actual running track is missing which is used for competitions.

(*iii*) Coach can't have full check over trainees.

(*iv*) Path may be dangerous or athlete may be lost from its destination.

3. (C) SPEED (DEFINITION, ITS TYPES AND METHODS TO DEVELOP)



Speed is the ability to perform movement at faster rate. In other words, it is the ability to move as fast as possible. Speed is basically dependent on heredity but can be improved through proper training. It depends upon heredity factor (white muscle fiber or fast twitch muscle fiber). It is one of the important components for sprinting and also required for fast response skills in games and sports. Speed can be measured through reflex test, short sprint, etc. For speed development sufficient level of strength, endurance, flexibility and coordinative ability are also required.

Speed has the following parts :

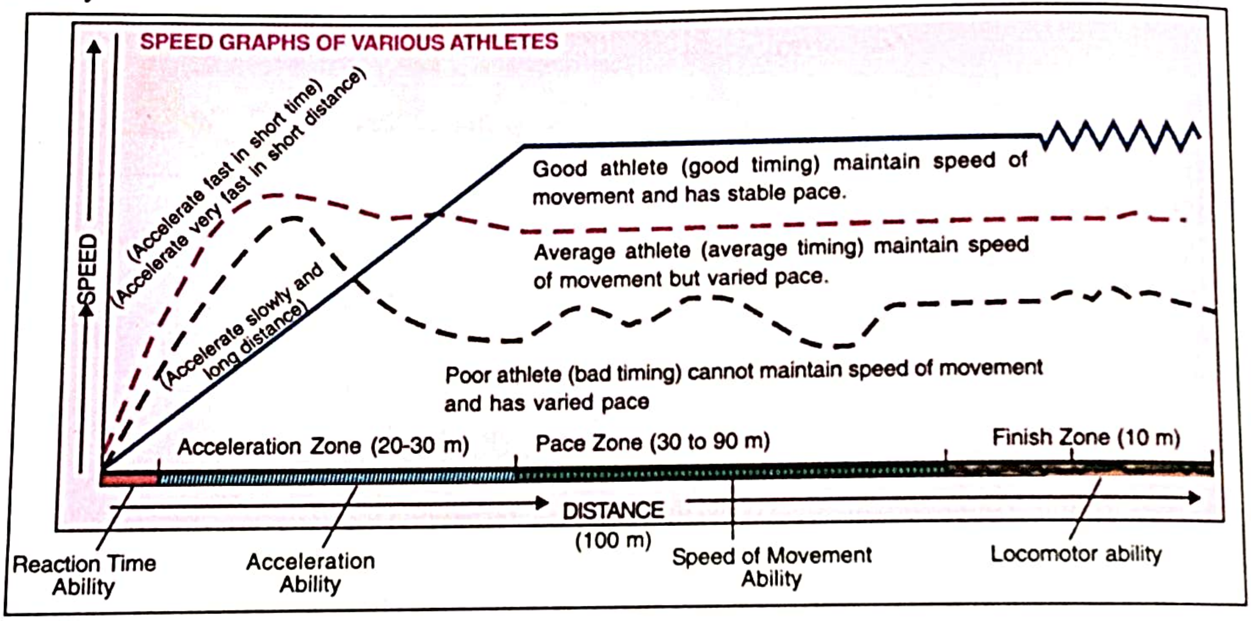
(a) Reaction Time : It is the time taken by the body to respond immediately after the stimulus. It can also be said as the first reaction to bring body into action.

(b) Acceleration Ability : It is the time taken by the body to reach maximum speed. This helps to gain initial speed during action. It depends upon explosive strength.

(c) Speed of Movement : It is the quickness of complete action or movement. In other words, it is the time taken by the body to perform complete action. It depends upon technique, explosive strength, flexibility and coordinative abilities.

(d) Locomotor Ability : It is maintaining of the top speed for longer duration with change of direction. It depends upon anaerobic endurance.

(e) Speed Endurance : This is the type of endurance in which the activity is done with high speed or intensity. This endurance is for shorter duration (from 30 seconds to 60 seconds) with 80% to 90% of top speed ability.



METHODS TO DEVELOP SPEED

(I) ACCELERATION RUN

This is the training method for developing the reaction time and acceleration zone or speed up zone in races. This method is generally used to develop speed while attaining maximum speed from a static position. Acceleration is the capacity to attain maximum speed in minimum time. In this method, athlete tries to attain top speed as fast as possible. After attaining the top speed the athlete gradually slows down.

Acceleration Run

This training is performed from the stationary position or from the crouch position. Athlete runs 40 to 50 meters distance with maximum speed so as to attain top speed. This is repeated 5 to 10 times with sufficient rest period. The rest period is 2 to 5 minutes to provide sufficient recovery. While performing acceleration runs, care should be taken that first few strides should be of shorter distance whereas frequency of steps are very fast afterwards longer strides. The correct running action should be practiced where body is slightly bent forward. Acceleration run should be started after proper warming-up. It is practiced 3 to 4 times in a week. It is usually practiced when competition is close.

Acceleration Run Schedule

(*i*) Speed or Intensity is 90 to 100 per cent of best possible ability.

(*ii*) Distance or Duration of work is 40 to 50 meters (in 4 to 6 seconds).

(*iii*) Number of Repetitions are 5 to 10 times.

(*iv*) Recovery Period is 2 to 5 minutes (sufficient recovery)

(*v*) Perform proper warming-up, crouch position during start, first few steps of short distance, body bent forward.

(II) PACE RUN

Pace is setting a stable speed which is a very important part of race. If pace is disturbed constantly then race is affected to great extent. Unstable pace creates great exertion, sometimes an athlete has to stop in-between the race due to variable pace, so proper pace is very important during races.

Pace Running over Treadmill

In this method, the stable pace or constant speed is maintained (approximately 800 meters distance) through various ways like continuous feedback by coach during running – like coach calls runners to "speed up more or slow down"; sometimes the 'time' is announced by coach to the runners so that they can cover a certain distance in a certain time. Even certain check marks are placed to adjust speed. Sometimes, the helper runners are used to guide pacing at different points. Nowadays, the modern machines called Treadmills (artificial running tracks which roll over the motor machine) are used to provide pacing. In this method, the speed is kept around 60 to 90 per cent of best ability. Distance can vary from 200 to 800 meters. This method develops anaerobic endurance for longer period, thus constant pace can be achieved. It is practiced three to four times in a week.

Advantages of Speed Development training method :

(*i*) It improves the reaction time of athlete, thus athlete takes quick start as the race begins.

(*ii*) Speed training method develops the acceleration ability, thus it helps athlete to reach maximum speed in the beginning.

(*iii*) It develops the capacity of the athlete to adjust his top speed.

(*iv*) It increases the anaerobic endurance by which athlete maintains his top speed for longer duration.

4. (A) FLEXIBILITY (DEFINITION, ITS TYPES AND METHOD TO DEVELOP)

Flexibility is the ability of joints to move in maximum range. In other words, this is the range of a joint to move maximum. Flexibility is specific to a given joint and dependent upon the musculature surrounding a joint. Flexibility varies from joint to joint due to its structure, surrounding, adjoining ligaments, tendons and muscles. It is measured through flexometer.

(A) ACTIVE FLEXIBILITY : It is performed without any external help or self movement of a part to maximum range. It is again of two types :

(*i*) Static Flexibility : It is the flexibility performed from stationary position, *e.g.*, Chakraasana, toe touching, sideward bending, etc.

(*ii*) Dynamic Flexibility : It is the flexibility performed while in motion or movement. This is required for gymnastics, diving, etc.

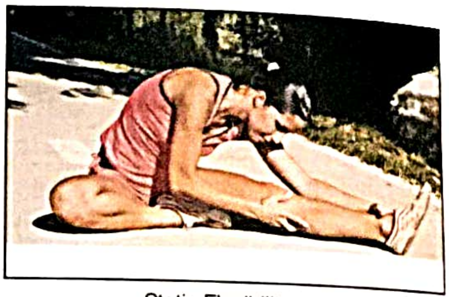
(B) PASSIVE FLEXIBILITY : It is the ability of joint to move in maximum range with external help, e.g., stretching with partner.

METHODS TO IMPROVE FLEXIBILITY

(I) ACTIVE FLEXIBILITY METHOD

In Active Flexibility Method, player performs flexibility exercise without any external help. In this method, individual tries to achieve maximum flexibility of joint through muscular activities. Thus, muscle fibers help to stretch the joint to maximum range. Active flexibility method is performed in two ways.

(A) STATIC FLEXIBILITY METHOD In this method, individual performs various slow stretching exercises from stationary position and holds the final position for some time (approximately 1 minute).


Static Flexibility

(B) SLOW STRETCHING AND HOLD METHOD In this method, the muscles are slowly stretched and final position is held for several seconds (approximately 30 seconds). Thus, the muscles are stretched and released so that greater length of muscles develop. These exercises are performed without any external help. Examples of these are like bending the body sideward or backward or forward. Various yogic asanas are also helpful for this like Paschimottan asana, Chakra asana, Hal asana, Akarna dhanur asana, Ardh matsyendra asana, Bhujang asana, Dhanur asana, etc.

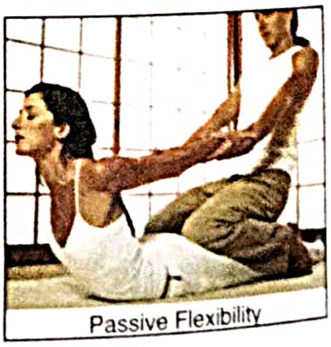
Chakra Asana

(C) BALLISTIC FLEXIBILITY METHOD In this method, individual performs various stretching exercises while in motion. Thus, these are stretching the muscles with the help of swinging the limbs for body segments. In this final position is not held whereas swinging helps to attain flexibility. It is performed without any external help. Some of these are like swinging the hands to sides; swinging the trunk to sideward, forward, backward; swinging the legs to sides, upward, backward, etc. Ballistic method may cause injury if body is not warmed up. It should proceed from slow swinging exercises in beginning followed by fast swinging exercises.

Ballistic Flexibility

(II) PASSIVE FLEXIBILITY METHOD

In this method, player performs various flexibility exercises with external help. In this method muscles are stretched by an external help like partner supporting for flexibility. Certain equipments such as stretch ropes, big role ball, bar stand, etc. are used. Care should be taken while providing partner support, i.e. jerky forceful pressure should be avoided. It is the most effective form of stretching and also considered as the most painful type of stretching.


Passive Flexibility

4. (B) COORDINATIVE ABILITY OR AGILITY (DEFINITION ITS TYPES AND METHODS TO DEVELOP)

It is the ability of the body to perform movement with perfection and efficiency. It is the ability to repeatedly execute a sequence of movements smoothly and accurately. This involves the senses, muscular contractions and joint movement. Every physical activity in life requires the ability to coordinate our limbs to achieve a successful outcome from walking to the complex movements in sports.

It is the ability of the human body to change direction quickly and effectively. In other words, it is the ability to change movement or direction in the shortest time without getting unbalanced. This provides good balance of body during action. It is, in fact, the proper combination of strength, speed, endurance and flexibility during movement. The accuracy of actions, rhythm, change of movement, balance, graceful action, etc. all depends upon coordinative ability. It is mainly neuromuscular coordination that depends upon central nervous system. It is required for almost every game. Coordinative Ability or Agility is of various types :

(*i*) Adaptive Ability : It is the ability that enables modifications of motor activity on the basis of comparison or anticipation of new or changing condition while performing activity. It can be gained through regular practice of certain skills of that particular activity.

(*ii*) Balance Ability : It is the ability to keep body or its parts in relatively stable position. This ability is improved through regular practice of balancing skill like walking on small step, standing on small duster etc.

(*iii*) Coupling Ability : This ability is also named as Combinatory ability It is the ability to put partial movements together into more complex movements. It is improved by performing complex skills regularly like football, foot movements for ball control or dribbling.

(*iv*) Kinesthetic Ability : It is the ability to realize kinesthetic and dynamic features of movement. It can be developed by balancing on moving objects, standing on raised heel with closed eyes, walking on rope etc.

(*v*) Rhythm Ability : It is the ability that enables to grasp motor movements and expresses that movements are in a very coordinated way with graceful actions. It improves by practicing dancing skills etc.

(*vi*) Orientation Ability : It is practice of coordiative exercises to response a complex movement and activity. This ability can be improved by participating in multi games and sports.

(*vii*) Differentiation Ability : Differentiation Ability is the ability to attain high level of fine tuning of movement phases. It is the ability to achieve high level of accuracy, perfection and economy of separate body movement and movement phases in a motor action. The high level of differentiation depends on movement experience and the degree of mastery over motor action like perfection of gymnastic movement.

5. CIRCUIT TRAINING

This is one of the methods for development of various components of physical fitness whereas it is popularly considered for the development of strength and endurance. **This method was developed by Morgan and Adamson. In circuit training method, a series of selective exercises are performed continuously without rest at different stations or points.**

It is performed at small place known as 'Circuit'. There are usually 5 to 10 selective exercises which are arranged in circuit training method. At each station, athlete has to perform certain specific exercise allotted to that station and then go to next station for completing the circuit. At each station

a particular type of exercise is performed without rest with certain number of repetitions or for certain time duration. Special care is taken so that successive stations should not have similar exercises involving same muscles. Athlete proceeds to next station after performing exercises of that station and goes on till end of circuit. This circuit set-up may be indoor or outdoor. The important thing to be kept in mind while selecting exercises is that each exercise should be different from the previous exercise. It should not consist of same muscular groups which were used at previous station, i.e. successive station should have different exercises.

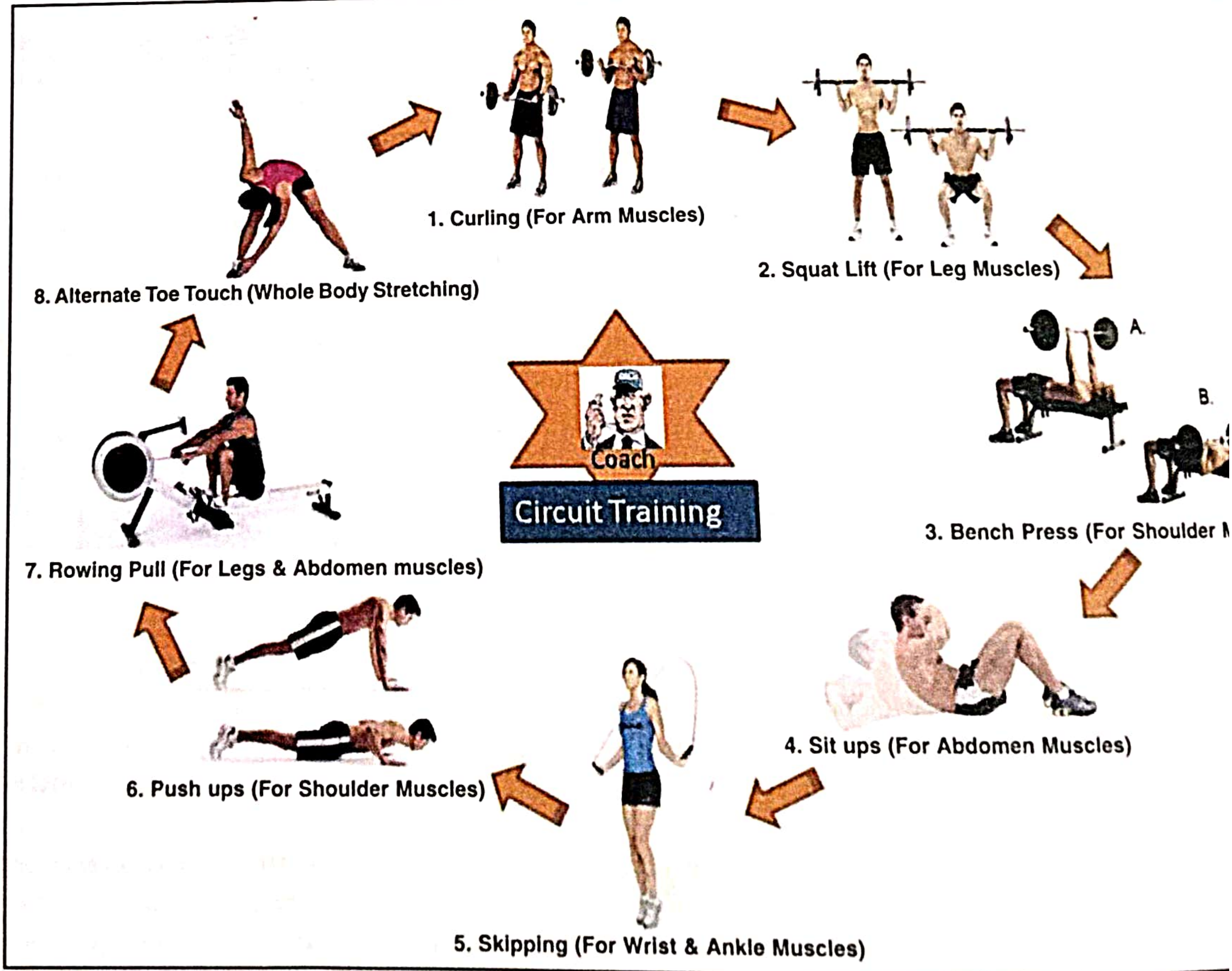
In circuit training method, the exercises are planned well in advance. The exercises in circuit training method consist of general exercises or exercise specifically related to particular game. We can increase the difficulty level by increasing the number of repetitions or by increasing the time duration.

Advantages of Circuit Training Method :

(*i*) It is the best method for beginners as it develops strength, endurance and coordinative ability.
(*ii*) A single person or coach can control a number of students.
(*iii*) 5 to 10 students can be trained at the same time.
(*iv*) Circuit training method does not create boredom as many varieties of exercises can be included.
(*v*) Maximum functioning of muscles can be gained in a single circuit.
(*vi*) General as well as specific exercises for the game can be performed.

Points to be considered in Circuit Training Session :

(*i*) Number of repetitions at each station.
(*ii*) Different exercises from the previous exercises.
(*iii*) No rest should be taken.
(*iv*) Duration of exercise (approximately 30 sec. to 2 min.)


1. Curling (For Arm Muscles)
2. Squat Lift (For Leg Muscles)
A.
B.
3. Bench Press (For Shoulder M
4. Sit ups (For Abdomen Muscles)
5. Skipping (For Wrist & Ankle Muscles)
6. Push ups (For Shoulder Muscles)
7. Rowing Pull (For Legs & Abdomen muscles)
8. Alternate Toe Touch (Whole Body Stretching)
Coach
Circuit Training

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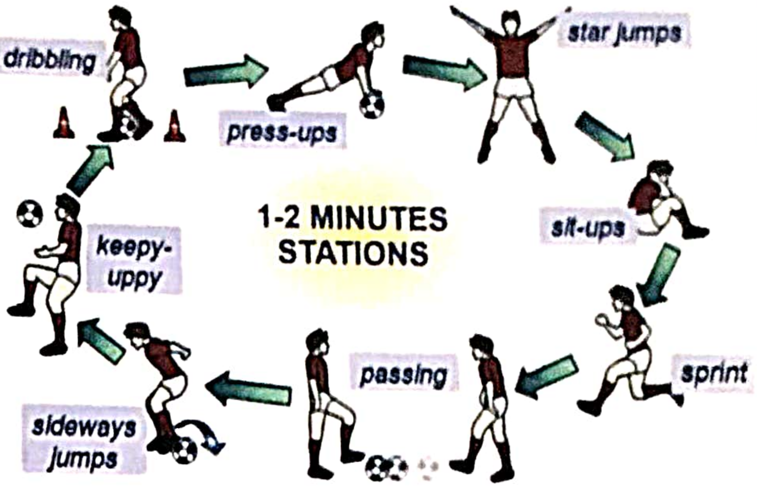
CIRCUIT TRAINING

Here is an example of a circuit designed for footballers.



Some Important Questions

Multiple Choice Questions (MCQs)

1. Sports Training means :

(*a*) Training to body builder
(*b*) Training to player for high performance
(*c*) Teaching the skills
(*d*) Finding mistakes in skills

2. The important principle of Sports Training :

(*a*) Continuity and Regularity
(*b*) Principle of Proper Overloading
(*c*) Principle of Individual Difference
(*d*) All of these

3. Sports training is the process of :

(*a*) Finding talent for sports
(*b*) Developing good body
(*c*) Training to develop player for high performance
(*d*) Correcting sports skills

4. Which of the following is not a principle of sports training ?

(*a*) Continuity or regularity
(*b*) Proper overloading
(*c*) Considering individual
(*d*) All of these

5. The recovery period after competition is known as :

(*a*) Preparatory Period (*b*) Competition period (*c*) Transitional Period (*d*) Cooling down

6. Training has become

(*a*) Scientific and systematic
(*b*) Disorganized and irrational
(*c*) Complex and painstaking
(*d*) Easy and approximate

7. The main benefit of systematic and scientific sports training is to increase

(*a*) Performance (*b*) Injuries (*c*) Physical labour (*d*) Supervision

8. Meso-cycle is a training of

(*a*) One week (*b*) 4 to 10 days (*c*) 3 to 6 weeks (*d*) 3 months

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